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Citizen's Guide to Facility Planning

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This Handbook, designed for the "lay" reader, is organized around a logical progression of questions that the involved citizen or local governmental official is likely to encounter in trying to influence the municipal sewage facilities planning process. The Handbook reflects the latest federal regulations and policies, as of January 1979, and assumes a level of interest that is more than casual on the part of the reader. This Handbook may be used in conjunction with "Municipal Wastewater Management, Public Involvement Activities Guide".

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Citizens Guide to Facility Planning

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January 1979

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FOREWORD

This handbook was prepared by The Conservation Foundation for use in a training program to acquaint citizen leaders with the important decisions that are made in planning for the management of municipal wastewater. The handbook was designed to:

- identify the key decisions throughout the planning process that are critical to the outcome of that process and to the future of the community;
- identify and analyze the environmental, economic, and social considerations that affect these important decisions;
- facilitate citizen input to those decisions by stripping the process of technical jargon, and helping the reader understand the community judgments that must be made; and
- help citizens understand the legal tools and participatory techniques that will facilitate their involvement in the planning process.

The Environmental Protection Agency and The Conservation Foundation initiated this training program in the belief that the impacts of constructing a community sewage treatment facility may have profound long-term environmental, economic, and social consequences. We felt that community involvement in planning for sewage treatment facilities would result in cleaner water at lower ultimate cost. Only careful public scrutiny can insure:

- that sewage treatment planning meets the present and future needs of the community;
- that all the relevant environmental, economic, and political data necessary to ensure effective implementation emerge;
- that appropriate measures are taken to mitigate negative impacts; and
- that a community develops a commitment to continued oversight of the operation and maintenance of the facility.

This handbook is organized around a logical progression of questions that the involved citizen or local governmental official is likely to encounter in trying to

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influence the municipal sewage facilities planning process. The handbook reflects the latest federal regulations and policies, as of January 1979, and assumes a level of interest that is more than casual on the part of the reader. The book does not contain a large number of citations, however, and the reader may wish to obtain copies of certain regulations from the Regional EPA Office. A detailed Table of Contents proceeding each chapter allows the reader to focus on selected issues without having to read the entire book.

This handbook has been designed for the "lay" reader, either governmental or nongovernmental. Nevertheless, certain technical terms were unavoidable. A glossary can be found in Appendix B. A second book is being published by EPA concurrently with this handbook. It contains a summary of the material in this book, plus descriptions of useful public involvement tools. That book, entitled Municipal Wastewater Management: Public Involvement Activities Guide (FRD-7) may be obtained by contacting the following address:

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Denver, Colorado 80225

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January 1979

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CHAPTER I

THE FEDERAL WATER QUALITY PROGRAMS: AN OVERVIEW

Controlling water pollution in this country's 78,267 square miles of lakes, rivers and streams is an enormous undertaking; meeting community wastewater treatment needs is a major part of that job. There are now 12,800 treatment plants operating in the United States, and another 6,200 under construction or planned. Over half of them fail to meet water quality standards. Solving this problem involves an immense planning job, huge outlays of money, coordination between federal, state and local governments and the active participation of concerned citizens.

For individual communities, planning for proper municipal waste treatment means making decisions that will affect the face and shape of the area for years to come. Public participation is therefore essential to preserve a community's values and goals. Yet the decisions made in planning are complex, complicated by technical jargon, and often difficult for concerned citizens to understand. This manual provides a citizen's guide to the process of planning for municipal wastewater management.

Goals and Strategies of the Federal Program

The current federal effort to clean up the nation's waters began in 1972 when Congress passed the Federal Water Pollution Control Act amendments.1/ Five years later, after sometimes controversial experience, the law was modified by the 1977 Clean Water Act. The two laws are collectively known as the Clean Water Act. Understanding the general intent of this legislation and other applicable federal laws is a first step in planning for the waste treatment needs of your community.

In 1972, Congress took the unprecedented step of deciding that the nation's waters could no longer be an integral part of waste treatment. The 1972 Amendments to the Federal Water Pollution Control Act begin: "The objective of this Act is to restore and maintain the chemical, physical and biological integrity of the Nation's waters." In its report on the legislation, the Senate noted: "...this legislation would clearly establish that no one has the right to pollute . . . and that pollution continues because of technological limits, not because of any inherent right to use the nation's waterways for the purpose of disposing of

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Portions of this chapter are adapted from manuscript by Barbara Reid Alexander.

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waste." The Act's ultimate goal is to eliminate the discharge of pollutants into any surface water by 1985. More immediately, by July 1, 1983, it seeks to achieve where possible, "an interim goal of water quality which provides for the protection and propagation of fish, wildlife and shellfish and provides for recreation in and on the water."

The Congress also recognized the enormous expense of cleaning up the nations's lakes, streams and rivers. Another theme, therefore, runs through the 1972 legislation: balancing water quality goals against the cost of achieving them.

Along with these new water quality goals came fundamental changes in strategies for controlling or eliminating pollution. Until 1972, the approach had been to designate a particular stretch of water for a particular use, such as recreation or drinking, and to establish an ambient stream standard (water quality standard) to permit that use. The total amount of pollutants allowed by that standard (the effluent load) was then divided up between current and future dischargers (industry and municipalities) along that stretch.

This approach was plagued with technical difficulties. First, by emphasizing direct water uses such as drinking, swimming or industrial consumption, it tended to minimize the importance of human health and the integrity of aquatic ecosystems. Second, water-use designations erroneously assumed that it was always possible to determine the threshold of damage for a body of water--that is, the amount of pollutants the water could absorb before itself becoming polluted. As a result, equitable and consistent enforcement often was impossible, and effluent discharges bore little relationship to instream water quality.

The 1972 Act sets as its primary goal the protection of aquatic ecosystems. As a central strategy, it substitutes for "use designations" a new set of standards (effluent limitations) to control pollution at its source--either point-sources (direct discharges from pipes), or nonpoint sources, (the more diffuse discharges such as runoff from agriculture or construction). The strategy was designed not only to be enforceable but also to impose more equitable and uniform requirements on similar polluters located in different places. For example, a paper mill located on a comparatively clean river would as a minimum be required to control its pollution to the same degree as a mill on a dirty river. Thus the clean river would be preserved, the dirty ones made cleaner, and polluters would no longer be motivated to locate their plants in areas with weak regulations.

Despite this basic strategy shift, water quality standards still play a significant, though secondary, role under the 1972 Act. Standards based on have been established for all surface waters; when the uniform source controls fail to meet these standards, more stringent controls based on water quality standards are to be imposed on a case-by-case basis. For example, if the imposition of uniform effluent limitations would not result in a given stream meeting its water quality standard, the dischargers on that stream might be given a stricter effluent limitation than the national uniform standard.

The 1972 legislation also brought about a major institutional change--a significant boost in federal authority, exercised by the U.S. Environmental Protection Agency(EPA). Yet, the state role, which had been preeminent before 1972, remains significant. Although the responsibilities of state and federal authority frequently overlap or fall into grey areas, it can be frequently said that:

- state water quality agencies establish all surface water quality standards, subject to EPA approval;
- EPA establishes effluent limits for both industrial and municipal dischargers;
- EPA regulations interpret the federal law and the federal/state relationship in implementing the law.

The 1977 Act

Under the 1977 Clean Water Act, source control remains the basic strategy for pollution control, but water quality standards have a new priority. A number of variances from previously specified tight deadlines also appeared in the 1977 Act.

The source control requirements of the 1972 and 1977 Clean Water Acts establish certain effluent limitation requirements--and deadlines for reaching them--for industrial and municipal point-source discharges. Publicly-owned sewage treatment works (POTW) must have achieved a level of treatment equivalent to secondary treatment by July 1, 1977 (unless they were subject to certain delays beyond their control, such as lack of availability of federal funds). They must achieve a level of treatment called Best Practicable Waste Treatment Technology (BPWTT) by July 1, 1983. The EPA has defined BPWTT as the equivalent of secondary treatment or whatever more stringent treatment level might be necessary to meet water quality standards.2/

Enforcement

The Clean Water Act requirements are backed up by significant financial and legal penalties and are enforced on industrial and municipal dischargers through permits, which describe the effluent limitation requirement of the point source discharge and other conditions to be imposed on individual dischargers, such as monitoring and schedules for compliance. These permits are part of the National Pollutant Discharge Elimination System (NPDES) and are issued and enforced by either an EPA Regional Office or by a state water quality agency (if EPA delegates authority to that state).

Federal Assistance to Communities

When it imposed these requirements and potential penalties, the Congress recognized the financial problems that municipal dischargers would have in meeting them. To provide incentives, therefore, the Clean Water Act offers federal money to cover 75 percent of the cost of constructing publicly-owned sewage treatment works. In fact, Congress clearly tied the regulatory requirements to the availability of these funds. Communities that have not met the 1977 deadline for secondary treatment of municipal discharges may receive a variance (until 1983), if one reason for noncompliance is a lack of federal money. Taken together, the sections of the current water quality laws that concern municipal wastewater are frequently called the municipal facilities program--the NPDES permits described above, which set limits for discharge, and grants for construction of publicly-owned treatment works are the program's two major elements.

To receive construction grants, communities must meet a series of conditions (based on Title II of the Act). Grants are awarded in three steps:

Step 1, the facilities planning phase, when most major decisions leading toward construction of publicly-owned treatment works are made;

Step 2, the design and specifications for the facility; and

Step 3, actual construction.

Plans completed under a Step 1 grant are also called Facilities Plans or 201 Plans (taking their name from the section of the Clean Water Act that establishes the conditions for planning municipal waste treatment facilities).

The conditions set for these steps by EPA recognize that the municipal facilities program runs inherent public policy risks similar to those encountered in the construction of highways:

- that large amounts of available federal money would reduce incentives for cost-effectiveness;
- that the presence of federal money would discourage local initiative and local spending;
- that inflated cost figures and fraud would drain significant parts of the available funds; and
- that secondary environmental impacts brought about by this public works project--especially those relating to the location of the facility--would in many cases create worse problems than those the project was designed to solve.

The EPA conditions, therefore, range from requirements for cost-effectiveness, user charges and industrial cost-recovery to requirements that alternative waste treatment methods be fully evaluated and that secondary environmental impacts receive substantial public scrutiny.

Public Participation

Communities should note that planning procedures for the Construction Grants Program include the broadbased requirements for public participation specified for all the Clean Water Act programs. These are described in Section 101(e) of the 1972 Federal Water Pollution Control Act Amendments:

> Public participation in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan, or program established by the EPA Administrator or any State under this Act shall be provided for, encouraged, and assisted by the Administrator and the States. The Administrator, in cooperation with the States, shall develop and publish regulations specifying minimum guidelines for public participation in such processes.

Again, community planners should be particularly aware that planning decisions made in the course of constructing a waste treatment facility can have long-lasting social, economic and political repercussions on each community. Public participation is crucial.

The Shalls and Shall-Nots

The effects on your community of all these national goals and policies can be conveniently summarized as the "shalls" and "shall-nots" of municipal waste treatment.3/

The EPA Administrator SHALL by law consider or give priority to five policies in administering the municipal facilities program:

1) Waste treatment management must provide for application of "the best practicable waste treatment technology before any discharge into receiving waters, including reclaiming and recycling of water, and confined disposal of pollutants so they will not migrate to cause water or other environmental pollution and shall provide for the consideration of advanced waste treatment techniques."

2) Waste treatment must be pursued on an areawide basis as far as possible and must provide for the control of all point and nonpoint sources of pollution. (See the description of section 208 later in this chapter.)

3) The Administrator must encourage revenue-producing waste treatment facilities that rely on recycling wastewater, confinement and containment of pollutants not recycled (i.e., no discharge), and disposal of any sludge in an environmentally acceptable way.

4) The Administrator must encourage waste treatment management that combines open space and recreational uses with waste treatment goals.

5) The Administrator must encourage techniques that will reduce total energy requirements.

The most important of the SHALL-NOT policies:

1) After June 30, 1974, EPA cannot approve grants that do not provide for evaluation of alternative techniques of waste treatment to determine the "best practicable waste treatment technology."

2) After September 1978, EPA cannot approve grants unless the applicant demonstrates the "innovative and alternative" waste treatment management techniques have been studied and evaluated.

3) After September 1978, grants cannot be approved unless potential recreation and open space opportunities are analyzed in planning for the proposed treatment facility.

These "shalls" and "shall-nots" demonstrate the clear intent of Congress to encourage ecological solutions to our waste treatment problems--solutions that rely on natural systems (lands, lagoons and marshes) for ecological disposal of wastewater. The municipal facilities program thus attempts much more than simply building a secondary treatment plant in every community.

Specific Planning Programs of the Clean Water Act: Section 303(e) and Section 208

The planning requirements of the Clean Water Act are spelled out in four sections of the legislation--Sections 106, 201, 208 and 303(e)--and are intended to bring the following results:

1) Achieving the 1983 water quality goal of fishable and swimmable waters;

2) Determining the information from which NPDES permits can be issued to impose discharge standards stricter than the uniform national standards where necessary to meet a state's water quality standards;

3) A management plan to control pollution from all point and nonpoint sources; and

4) A process to ensure that federal construction grants are spent to build the most costeffective treatment works.

Two of these sections of the Act--Sections 303(e) and 208--are intended to work together to bring about a Water Quality Management Plan in each state. These statewide plans should then form the framework for individual facility plans. Since most of 208 planning is conducted by local governments on a regional basis, and the planning requirements of Section 303 are conducted by the State, these two planning programs are often considered separately, and their respective requirements are usually addressed in separate documents. New regulatory strategies being considered by EPA would better integrate these two planning functions.

303(e) planning, conducted solely by the state (unless subcontracted to a local agency), concentrates on the water quality of entire river basins. It determines what discharges will be allowed along particular waters. Bodies of water are classified either as effluent-limited (where uniform national discharge limits are enough to meet state water quality standards) or water-quality limited (where stricter limits are needed to meet state standards). The resulting discharge limits are written into the NPDES permits and must be incorporated in local planning. These river basin plans also must decide how to prevent waters of high quality from being degraded, how water quality standards can be revised, and which stream segments should receive priority attention.

Planning under Section 208 is conducted on an areawide basis within states in regions designated by the governor, or, in nondesignated areas, on a statewide basis. These plans must address all point and nonpoint sources of pollution within the area in order to achieve fishable and swimmable waters by 1983. The 208 plans control pollution by placing limits on discharge, by regulating the location of potential pollution-causing activities, by regulating certain management practices (such as the manner in which construction activity is carried out), or by some combination of all three.

Areawide planning under Section 208 is based on the congressional acknowledgement that land use practices can often directly or indirectly affect water quality. Therefore, areawide plans must create a program to regulate the location, modification and construction of any facilities (municipal or industrial) in the area that might cause pollution. More to the point for municipal dischargers, the 208 plan must include a comprehensive areawide waste treatement management program based on the goals in Title II of the Clean Water Act ("best practicable waste treatment technology," no discharge, and use of recycling).

The 208 plan must also contain a program to control diffuse sources of pollutants (nonpoint sources). This means identifying and implementing practices that lead to nonpoint source pollution by controlling the management of activities such as farming, timber harvesting, mining, construction, sludge disposal or dredge and fill activities, activities that affect groundwaters, and intrusion of salt water.

One unusual aspect of 208 planning is that it must identify the measures needed to carry out the final plan and must recommend appropriate state, regional or local agencies to carry them out. This implementation strategy is a crucial element; many past planning efforts have failed for lack of one. Finally, the 208 plan is designed to be at least partially self-implementing: No permits or construction grants are to be issued unless they are consistent with the plan.

Controversy and Confusion

Under the original timetable of the Clean Water Act, the above described plans for pollution control were to be developed at the same time that the first NPDES permits were issued and the first construction grants given. Eventually the water quality plans, the regulatory decisions and the construction grants would fit together. Unfortunately, this integration of planning and action is far behind schedule. Confusion and conflicts have resulted.

In the early stages of implementing the Act, the EPA decided to deemphasize the areawide planning of Section 208 in favor of the statewide planning under Section 303(e), since the statewide plans would be needed to establish effluent limits for municipal and industrial facilities. Thus, the first areawide plans are just now being completed, and few have been fully approved or implemented.

Detailed regulations were prepared for individual sewage treatment facilities constructed with federal funds, and over $18 billion has already been spent or obligated for the planning, design and construction of sewage plants. Therefore, decisions have been made and concrete poured for projects that may not fit into the objectives of the areawide 208 plans.

Draft Regulations for Water Quality Management Program

Draft water quality management regulations published in the Federal Register on September 12, 1978,4/ herald a new era in water quality management planning.

A formal state/EPA agreement designed to integrate the planning elements of EPA's environmental laws would become the central management tool for a newly unified Water Quality Management Program. The Water Quality Management portion of the state/EPA agreement would cover many programs for which EPA provides the state water quality agency with financial assistance --including areawide and basin planning, permit programs and construction grant management.

Proposed regulations renew emphasis on yearly program outputs, and on an implementation of water quality management plans. Proposed sanctions for lack of implementation include withdrawal and possible recovery of federal grants.

How Will Water Quality Management Planning Relate to Facilities Planning in the Future?

Both the proposed planning regulations and newly promulgated construction grant regulations make clear that the ties between Water Quality Management Planning (WQM planning) and facilities planning will be much tighter in the future. Critical and often controversial decisions in the planning for municipal wastewater management will be made at the state or areawide level through the Water Quality Management process. A citizen wishing to become involved in local facilities planning will find that he may have to seek amendment of critical decisions through a formally established Continuing Planning Process that is part of the state water quality management program.

The details of the facilities planning decisions made during water quality management planning are discussed at appropriate points in other chapters. These decisions are:

- priority funding
- effluent limitations
- delineation of facilities planning areas; and
- population projections

Generally, no grants for treatment works are to be given unless they are consistent with an approved Water Quality Management Plan. After October 1, 1979, if construction grant related information is not available in an approved WQM Plan, the grant may not be given (unless the EPA Regional Administrator determines in writing . . . that the facility related information was not within the scope of the WQM work program, or that award of the 201 facilities planning grant is necessary to achieve water quality.5/

Other Federal Laws That Affect Treatment Facilities

More than 25 other federal environmental statutes and Executive Orders affect construction grants for sewage treatment plants. The most important will be introduced briefly here and some will be discussed in more detail in succeeding chapters.

The Clean Air Act imposes controls on sources of air pollution, including municipal incinerators that burn sludge. Section 316 of the 1977 amendments authorizes the EPA Administrator to condition wastewater treatment construction grants on control of air pollution associated with secondary impacts of plant construction. State air quality implementation plans may limit plant size and location to control subsequent housing development that might contribute to air pollution.

Under the Wetlands Executive Order, Number 11990, federal agencies shall not finance new construction in wetlands unless the head of the agency makes two findings:

- there is no practicable alternative;
- the proposed action includes all practicable measures to minimize the harm that may result from such use.

While this order does not completely prohibit treatment plants from wetlands, its strong language reinforces EPA's policy of preserving wetlands. It may affect siting decisions that would put a plant near a coast or river, which may be within the wetlands zone.

The Floodplains Management Executive Order, Number 11988, is intended to avoid the long and short-term impacts of floodplain development wherever there is a practicable alternative. Guidelines written by the federal Water Resources Council explain how to identify floodplains and provide standard definitions and methodology for identifying alternatives.6/ EPA must write implementing guidance for its actions before February 1979.

The Archeological and Historical Preservation Statutes, through the Advisory Council on Historic Preservation, require identification of historical or archeological resources of special value. If such places qualify for the National Register of Historic Places, the Advisory Council and a state's historic preservation officer must agree on measures to protect such sites before construction or further action in the area.

The Endangered Species Act of 1973 prohibits federal actions that jeopardize threatened or endangered species of plants and animals as listed by the U.S. Department of the Interior. The Environmental Impact Statement (EIS--see below) for a facility usually will discuss possible impacts on endangered species, and the Department of the Interior will then comment on expected impacts and suggest mitigation measures.

Other federal laws may be important in particular situations. The Coastal Zone Management Act helps coastal states to develop and implement coastal zone management programs. In some states it may require special review of a proposed treatment facility that would affect new development in the coastal zone, access to the coast, or coastal water quality. The law requires that approved state coastal zone management programs be given opportunity to comment on federal grants and licenses; grants and licenses must then be consistent with the state coastal program.

The Wild and Scenic Rivers Act may require special protection for designated river segments. Procedures for resolving conflicts over discharges into these rivers currently are being outlined by the Departments of Agriculture and Interior.

The Safe Drinking Water Act includes a procedure for designating "sole source aquifers"--water sources that provide a community's entire water supply. Designated aquifer-recharge areas are protected from any federal action that would contribute to contamination, including discharge from treatment plants or underground storage of pollutants. The EPA Administrator implements the procedure.

The National Environmental Policy Act of 1969 (NEPA).7/

This law requires an Environmental Impact Statement (EIS) before federal agencies proceed with actions that significantly affect the environment, including wastewater treatment plant construction grants.

Under NEPA, a lead agency is designated to prepare the impact statement. For construction grants, EPA is responsible for EIS preparation. The details about alternatives and impacts in the EIS are shared with the public and other federal agencies. The EIS is a vital document that permits evaluation of a construction grant in the light of other federal laws and requirements including many of those described above.

NEPA also provides strong policy guidance to federal agencies. In the past, it has been the means of delaying projects while alternatives were explored or other federal laws were applied. Current legal interpretations are requiring potential litigants to have participated in various administrative procedures (such as the EIS process and other public planning procedures) before resorting to court action.

Thus, participation in the facility planning process would possibly be a prerequisite to a NEPA lawsuit.

What is the Role of the Courts in Enforcing EPA Compliance With Other Federal Laws?

The courts may enforce statutory procedures like NEPA's Environmental Impact Statements or Advisory Council on Historic Preservation consultation if the EPA fails to follow the statutes and implementing guidelines. The Endangered Species Act provides a specific rule, enforceable in court (and which can only be modified by Congress), that endangered species shall not be further destroyed.

Courtroom challenges may be based on constitutional principles as well as laws. In New Jersey, for example, a challenge alleges discriminatory housing impacts as a result of EPA regulations and guidelines that use local zoning in facility planning. It is based on both constitutional equal protection principles and fair housing statutes.

Where the law requires a judgment by EPA, such as the designation of a "sole source aquifer," courts generally presume that the judgment is appropriate unless it is arbitrary or without any basis in fact. This makes it difficult to challenge EPA judgments. More typically, environmental lawsuits argue that the agency has failed to act in a way required by law, a fact which is demonstrable and usually reviewable in court.

Executive Orders, like the Floodplains Management Order and the Wetlands Order, are enforced through executive action by the President. This means that EPA is primarily responsible for policing its compliance; a court suit for enforcement is unlikely.

FOOTNOTES - CHAPTER I

1. Federal Water Pollution Control Act Amendments of 1972, 33 USC, Sec. 1251-1376, (Amended by the Clean Water Act of 1977).

2. Secondary treatment as defined by EPA regulations is that level of treatment which will achieve 85 percent removal of BOD and suspended solids and ensure maintenance of pH values between 6 and 1. (Some exceptions for suspended solids are allowed in the case of waste stabilization ponds.) 40 CFR, Part 133.102.

3. These policies are found in the various parts of Section 201 of Title II of the Clean Water Act of 1977, 33 USC 125 et seq.

4. EPA "Proposed Water Quality Management Regulations," _Fed_. _Reg_. pp. 40742-40757, Sept. 12, 1978. (40 CFR, Subpart G, Part 35).

5. 40 CFR, Part 35.917(e).

6. Water Resources Council "Guidelines on Floodplain Management, 43 _Fed_. _Reg_., pp. 6030-6055., Feb. 10, 1978

7. National Environmental Policy Act of 1969. CEQ guidelines for implementing NEPA Aug. 1, 1973. These guidelines will be substantially revised by new NEPA regulations (43 _Fed_. _Reg_., pp. 55990-56006, Nov. 29, 1978) scheduled to become effective July 1, 1979.

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CHAPTER II

SEWAGE TREATMENT PLANNING IN A COMMUNITY CONTEXT

The Need for Treatment

Until recently, wastewater treatment and disposal in most communities has failed to meet Clean Water Act standards. When the 1972 law was enacted, many localities provided no treatment at all or only the most basic screening (primary treatment) of their wastewater. What happens when such untreated or undertreated wastewater enters the environment?

When natural waters are used as a sewer, basic ecological relationships are disturbed, resulting in long-term adverse consequences for both the natural environment and water users. Many contaminants found in wastewater directly affect the aquatic environment, including bacteria, concentrated amounts of nutrients (such as phosphorus and nitrogen), toxic chemicals, heavy metals (such as cadmium or mercury) and excesses of organic solids that accumulate on the bottoms of lakes, rivers and streams. Most of these contaminants occur naturally in small amounts, depending on development in the area and patterns of rainwater runoff. Large forests or pasture areas, for example, may produce significant contamination from the bacteria in animal wastes. But large and concentrated discharge of undertreated wastes from a treatment plant into surface waters greatly degrades those waters' value as a fish and wildlife habitat and often makes them unsuitable for drinking or recreation.

In many places, the groundwater system is also threatened by poorly treated wastewater and by saltwater intrusion caused by excessive withdrawal for use. Treated water may be used to restore the groundwater system, especially when treatment produces water of higher quality than existing groundwater. Groundwater supplies are recharged by precipitation, by seepage from rivers and streams, by absorption and storage of rainfall in soils, and in some cases by underflow from adjacent areas. The rate of recharge depends on many conditions: the type of soil, density of vegetation, intensity of rainfall, terrain, buildings, coverage with impermeable surfaces (such as paving of roads and parking lots) and compaction of soil.

This chapter has been adapted from manuscrip by John S. Banta.

Types of Treatment

Levels of wastewater treatment include the following:

Primary Treatment - The first stage in wastewater treatment in which substantially all floating or settleable solids are mechanically removed by screening and sedimentation. The process generally removes 30-35 percent of total organic pollutants.

Secondary Treatment - Wastewater treatment beyond the primary stage, utilizing bacteria to consume the organic pollutants. A number of processes may be used to achieve what EPA defines as acceptable secondary treatment standards--85-90 percent removal of total organic pollutants and suspended solids.

Advanced Treatment - Treatment beyond the secondary or biological stage is required to meet strict quality standards. Depending on the process selected, advanced or tertiary treatment can provide additional removal of standard organic polutants suspended solids, inorganic ions or nutrients such as phosphorus and nitrogen. Advanced treatment is the "polishing stage" of wastewater treatment and generally produces a high quality effluent.

The 1972 Clean Water Act requires municipal dischargers to achieve the minimum level of pollutant removal possible through a well run secondary treatment system. (In some cases as discussed in Chapter I, even stricter standards must be reached by some dischargers to meet goals for river basins. These stricter standards may require advanced or tertiary treatment, which may produce "drinkable" water.)

A community that plans to upgrade the treatment level of an existing plant, expand capacity of its existing facility or provide new treatment capacity may choose from among six basic categories of treatment and management options:

1) conventional, "centralized" physical/chemical/biological treatment and discharge of treated wastewater into streams, lakes or rivers;

2) centralized treatment but with effluent disposed of on the land;

3) waste treatment and reuse of purified water;

4) increase capacity of existing facility by flow reduction measures;

5) small, onsite options such as individual and community septic fields and composting toilets; and

6) systems combining appropriate treatment components of any of the above.

These treatment options and the conditions that affect selection of each are described in more detail in Chapter V.

The By-Products of Wastewater Treatment

To meet Clean Water Act goals, of course, a wastewater treatment system must produce relatively clean water that will not degrade natural streams and lakes. The treatment process may also leave behind by-products that may bring benefits or problems: large amounts of solid waste, either as sludge or in other forms, organic chemicals; and treated water that may be clean enough to recycle for agriculture and other uses.

Sludge. To achieve fishable, swimmable waters using conventional technology, a treatment facility must remove the bulk of human wastes from wastewater, leaving behind solid waste that must be disposed of. Sludge is in fact a major by-product of most conventional treatment facilities. The makeup of sludge or concentrated solid waste depends largely on the kind of pollutants entering the system. Systems with industrial as well as residential users may find toxic chemicals or heavy metals in their sludge (such as mercury or cadmium) posing special problems for disposal. Much sludge may be either disposed of on land or burned, possibly creating solid waste disposal problems or air pollution problems. In other cases, the sludge may be basically organic, making it suitable for composting or for being made into usable soil components. It may be utilized as supplemental fertilizer on farm land or to restore lands stripped of natural vegetation through mining operations.

Whatever the makeup of solid waste, a large treatment system plant will produce a lot of it. A conventional primary treatment plant that processes 1 million gallons of wastewater per day (1 MGD) will produce an average of from 1 to 1.5 tons of sludge each day. The amount varies directly with the size of the plant. Different treatments of the sludge may reduce it to essentially dry waste or leave it in partial solution for application to land.

Chemicals. Some tertiary processes may produce significant amounts of various organic chemicals: including nitrogen compounds (which may be spread on the land during or through a spray irrigation treatment process or discharged into the water) and carbon, phosphorus and amonia--all of of which have high resale potential.

Recyclable water. Reliable secondary and tertiary treatment can turn wastewater into a potentially recyclable resource for use in agriculture, industry or for return to the natural environment. Treated water returned to natural streams may actually improve water quality--for example, when seasonal low flows in streams (aggravated by withdrawal for industrial or agricultural use) leave inadequate supplies or poor quality water for fish, wildlife and recreation. Properly treated wastewater may be cleaner than the low flow stream water and may thus enhance the aquatic environment and perhaps allow water recreation where it had been unsafe. This recreation component can be especialy significant in areas where low flows occur during the summer. In some cases the recycling of wastewater can be most effectively exploited through innovative treatment techniques.

Performance of Treatment Plants

The amount of water treated and the quality of treatment depend most fundamentally on the nature of the treatment plant--its capacity, techniques, level of treatment and storage--which will affect the outflows during normal operation and at periods of peak flow. ("Peak flow" usually occurs when stormwater enters a system through combined storm/sanitary sewers or through infiltration into old and leaking sewers.)

But how well the plant is operated and maintained also can affect treatment levels and reliability. Many of the smaller treatment plants built in the early 1960's have been criticized for breakdowns due to lack of supervision or poor maintenance. The quality and skill of the operator are important too. Any plant failure, whether due to breakdown, power loss or other operational problems, may lead to discharge of untreated sewage or grossly inadequate treatment until the problem is remedied. Financial support for operation and maintenance is currently derived solely from the local community.

Finally, the quality of incoming water can have significant effects on the performance of treatment plants. Some incoming wastewater may contain toxic chemicals or heavy metals that are difficult or impossible to remove completely. These same materials may disrupt the biological treatment process of the sewage treatment plant and may prevent the plant from operating at design levels. It may be more efficent to remove these pollutants at their source rather than in a community facility. (Hence, some industries may be required to pretreat their wastes before discharging them to a municipal system.)

Potential Points of Conflict

Once a community decides to address its sewage treatment problems, it may anticipate a number of controversies as possible alternatives are considered. Some of the key conflicts may arise over:

I. "Direct" or "primary" environmental impacts

  A. Disposal of solid waste generated by improved secondary and advanced wastewater treatment

  B. Protection of community water supplies, especially from toxic chemical and heavy metal contamination

  C. The siting and construction of treatment plant and sewer system has the potential to jeopardize wildlife habitate, historic/archaeological resources and create odors or aesthetic eyesores for neighboring property owners, etc.

II. "Secondary" environmental impacts

  A. Location of new residential development

  B. The relationship of growth to conservation of prime agricultural land

  C. Control and planning of future industrial and commercial growth to best utilize the land and to avoid damaging existing resources

  D. Minimizing flood hazard risks and protecting wetlands and other environmentally sensitive lands

III. Economic and social conflicts

  A. The cost, quantity and type of new housing available in a community

  B. Changing property values for existing homes

  C. The type of new industrial development incentives

  D. Distribution and amount of charges to pay for the community's share of the capital costs, operation and maintenance of the facility

  E. The appropriateness of facilities to rapidly changing short and long-term social and economic needs in a community

These types of conflicts will arise whenever choices have to be made--facility location and design, type of treatment process, plant capacity, service area, solid

TABLE 1. IMPACT CATEGORIES OF SEWAGE TREATMENT PLANT CONSTRUCTION

Land Use	Aesthetic	Mechanical	Risks
Wildlife - habitat destruction - relocation - destruction	Visual disruption	Traffic	Property value changes
	Noise	Disturb commercial/ residential activity	Floods
Vegetation - revegetation - destruction	Dust	Commuting by employees	Seismic activity
	Odor	Housing for employees	Safety (public health - construction - water/air pollution
Loss of environmentally sensitive areas	Loss of open land/ greenery	Air pollution by machinery	
Incompatible adjacent land uses		Water quality degradation - surface water - groundwater	
Erosion		Energy consumption	
Loss of agricultural land			
Archaeological losses			
Growth in population			
Disposal/reuse land utilization			

waste disposal, water reuse and others. The impacts of building or expanding a municipal wastewater treatment facility can be grouped into the four sets of potential impacts outlined in Table 1: Land Use; Aesthetic, Mechanical, and Risks.

"Direct" or "Primary" Impacts of Construction

Perhaps the most important variable in assessing the primary environmental impacts of sewage treatment plant construction is the site selection for the treatment plant. What sites are available and the location of potential sludge disposal areas may determine what level of treatment is possible, the extent to which capacity can be expanded to meet future needs, and what techniques are required to meet water quality standards.

Ironically, cities with the greatest need for new facilities are often high-density urban areas with few suitable sites for new facilities. If such cities require both tertiary treatment--which creates a need for storage capacity and usually produces a large volume of sludge--as well as a significant reserve capacity for the future, their problems become particularly acute.

Direct impacts are interrelated. For example, if a planner hopes to minimize environmental disruption or loss of prime land, the project should likely be built within a developed area. But such siting increases aesthetic impacts on residents: unsightly construction and traffic disruption as the plant is built, noise and possible odors. Planners in Monterey, California, faced this kind of dilemma when the only available sites were on prime farmland--a principal source of artichokes for a national market. In the end, agriculture was forced to less desirable land.

Impacts that are less obvious may include erosion, loss of wildlife habitats and destruction of open space. Plant siting will determine where recycled wastewater will be available for users. It will also affect the layout of sewer pipes leading from the plant to residential, commercial and industrial users--with the impacts described below--and thus directly influence the potential for new housing construction in different areas of a community.

Interceptor sewers are the large sewer pipes that link the treatment plant to the smaller residential collector sewers (trunks, mains, laterals, etc., see glossary) which provide individual service. Many interceptors may branch off from a large plant; only a single interceptor may be needed for a small plant.

A basic policy choice controls the primary impacts of construction and operation of interceptor sewers: Should the pipelines follow existing rights-of-way or break through undeveloped land? Breaking new ground destroys flora and fauna but may avoid traffic disruption or noise pollution in a residential area during construction. It also may trigger pressures to develop such undeveloped land, unless access to the sewer is restricted. On the other hand, following existing rights-of-way may bring desirable new development or new roads, or create new public rights-of-way across open country. Table 2 notes the primary impacts of interceptor construction and operaton.

Collector sewers are the smaller pipelines that connect homes and businesses with the interceptors, thus actually providing sewer services to individual users. Like interceptors, their primary impacts tend to be aesthetic: construction, noise, odor, visual intrusion, dust and inconvenience.

There are, however, important differences between impacts of collector and interceptor sewers. First, collectors are simply closer to users and therefore more obvious, especially if repair teams must dig up a homeowner's front lawn to repair a pipe. This impact is magnified by the fact that while interceptors have a useful life of 20 to 50 years, collectors require more frequent maintenance, thus, creating recurring evidence of their existence.

Finally, collectors are more liable to infiltration by stormwater, which may cause problems in other parts of the sewage system--possibly affecting plant capacity, for example. Repairs or replacement of the system may be needed to remedy such problems.

"Secondary" Impacts of Facility Construction

"Secondary" impacts refer to subtle but persistent changes in timing, density, type and location of new residential, commercial and industrial development brought about by construction of a new or expanded treatment facility. Because wastewater treatment and access to sewers are prerequisites for most new housing construciton, the decision to provide service will largely determine a community's development opportunities.

In the broadest sense, secondary impacts include all factors arising from poorly conceived or executed development. Many people see sewers as a source of pressure to build and sell new housing, perhaps because some communities seek to recover their share of facilities costs through new tax assessments on new homeowners. Or a large facility may be sought because communities want to take full advantage of currently available funding.

TABLE 2. INTERCEPTOR CONSTRUCTION AND MAINTENANCE PRIMARY IMPACTS

Impacts of Construction	Impacts of Operation/Maintenance
Wildlife disturbance	Noise
Wildlife loss	Energy consumption by repair teams
Habitat loss	Revegetation problems
Water quality degradation	Erosion
Erosion	Water quality degradation
Loss of agricultural land	Traffic disruption by repair teams
Noise	
Air pollution from machinery	
Dust	
Traffic disruption	
Visual disruption	
Energy consumed by constructgion	
Loss of vegetation/rare plants	

In the continuing national debate, many planners argue convincingly that sewers and sewage treatment plants are rarely the cause of growth in a region. There is, however, little argument that the siting of sewers and treatment plants has a direct influence on the location of that growth within a region.

Some secondary impacts are singled out for special attention by federal law. These include destruction of endangered species habitats, construction in wetlands, unsafe construction on floodplains, and degraded air quality in special "air quality maintenance" areas. Other impacts may be of special concern to states or communities. Sewer service to steep slope areas, for example, may lead to unsafe building sites, erosion and public safety problems.

Economic and Social Impacts

Local governments may find the cost of providing the necessary or desirable level and capacity of wastewater treatment overwhelming. The extent of this economic impact may not always be realized until the facility is built. Local governments must pay for all capital costs not covered by federal and state grants. The local share includes that portion of the 25 percent nonfederal share not paid by the states, plus items ineligible for federal financial assistance such as lateral sewers, most collector sewers, and reserve capacity beyond that allowed by EPA regulations. In many cases their share of the cost may exceed 25 percent of the total system costs. In addition, local users of the sytem must absorb the costs of operation and maintenance. Faced with this expense, the community must grapple with difficult questions: How will the local share be financed? Who in the community should pay?

One alternative is to decide that the entire community should pay for the treatment system; therefore, the local share of capital costs can be financed through general revenue bonds. This action, however, might severely strain the bond credit rating of some communities (if they are able to issue bonds at all), thus precluding their ability to raise funds for other necessary capital investments.

Another option is for the community to cover only a portion of the capital costs, to require developers to cover the costs for installing lateral sewers and house connections, and homeowners to pay a one-time hookup fee. Part of the overall costs would then be passed on to new homebuyers in the form of higher prices. This approach, however, may raise questions of equity--Are newcomers paying a disproportionate share?--and of community responsibility to provide moderate-income housing.

As for the costs of operation and maintenance (O & M), communities generally will attempt to recover these costs directly from the system's users by charging a monthly service fee based on how much sewage is generated. In some cases, however, particularly when a system is designed to accommodate substantial future growth, the initial number of users may not be enough to cover costs without imposing great burdens on customers. Until the number of users approaches the design capacity, the community may have to subsidize O & M costs with general tax revenues.

It is of paramount importance that communities understand the total costs of all its sewage treatment system alternatives before any final decision is made. For example, a decision to economize by building a plant with only limited reserve capacity may mean that 10 years later the community will be forced to finance expansion of the plant (possibly without any federal assistance) if future development exceeds expectations. Failure to accurately assess total O & M costs for each alternative system could lead to some form of taxpayers' revolt (as is now occurring in Manassas Park, Va.) once citizens discover the price they are being asked to pay.

Another potential impact to be considered is the fact that access to treatment facilities not only affects the location of housing, but also the type and quantity of housing available and, ultimately, housing costs. Sewering an area usually permits high-density development such as townhouses, garden apartments or high-rises. Since high-density development tends to be less expensive than building single family homes, communities may consider sewering as an opportunity to provide more moderately-priced housing.

On the other hand, some communities may decide that providing lower-cost housing will simply encourage rapid and unwanted growth. Thus, they may choose to limit the capacity of the treatment plant and its service area or restrict access to the system. Communities should be aware, however, that such ostensible growth control measures may be challenged as discriminatory. In New Jersey, for example, the office of Public Advocate is challenging EPA construction grants conditions on the the grounds that EPA must consider fair housing concerns along with traditional environmental and economic concerns. *

Finally, the impacts of facility construction may cause a decrease in the property values of adjacent lands. Presumably such a loss would be more than offset by property value increases in other parts of the community as a direct

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* Title VIII of the Civil Rights Act of 1968 gives EPA some responsibilities for encouraging fair housing programs in its constructioan grants activities (42 USC 3601 et. seg.).

or indirect result of improved water quality. Changes in property values may pose thorny questions of equity, however, since citizens faced with decreased property values are not likely to be comforted by increases for others.

The Cost of Delays

The direct, secondary, economic and social impacts of construction must be consciously raised and carefully considered very early in the facility planning process. Otherwise they later could become the focus of intense public controversy, causing lengthy delays in design and construction of a treatment system. Delays mean added economic, social and environmental costs that the community ultimately must bear. Not only will delays inevitably push up the final price tag of the selected alternative, but they will postpone resolution of the community's water quality problems.

After Construction

When construction is completed, the community must make sure that its facility is well operated and maintained and meets design standards. The community will be responsible for meeting the effluent limitations of its NPDES permit; enforcement actions for violation of permit conditions may bring substantial civil fines and/or criminal penalties.

In the past, many systems built primarily with federal funds have not operated to design capacity. Complex, high technology systems sometimes were designed for communities with neither the financial nor technical resources to ensure adequate operation.

The Clean Water Act deals with this problem in two ways. First, communities are required to have a detailed operation and maintenance plan in place before construction is complete. Second, they are required to have a system of user charges to pay operation and maintenance costs. A treatment facility frequently becomes controversial and receives community attention at the time the user charge system is adopted. That is when many small communities have found that high technology systems built with seemingly "free" federal and state grants are costly to operate. Delays in construction (and resulting inflationary costs) can result from community debates that take place too late in the process to be very effective. Concerned citizens will want to see that the user charge debate is raised publicly early in the facilities planning process.

The community is also responsible for any future expansion. The completed treatment facility will have a reserve capacity for future expansion equal to the 20-year population projection approved by the state and EPA and found in the appropriate water quality management plans.

(See Chapter V). The community will want to start actively actively planning expansions after 10 of those 20 years have elapsed. Population projections may not be accurate, and concerned citizens and local government will want to keep close tabs on area demographics in order to begin planning for expansion in time to prevent sewer hookup moratoriums and/or overloaded treatment plants.

It is likely that any future expansions will have to be paid for by the community. The Clean Water Act allows communities to retain a portion of the capital costs recovered from industry through the Industrial Cost Recovery System (see Chapter V) to help pay for future expansions. This money may not be enough, however, so financial planning for future expansions will be an important community responsibility.

Planning Alternatives: An Example

The following example illustrates how treatment planning choices depend heavily on two factors: natural features (slopes, watershed boundaries and soils) and political decisions about patterns of future community growth (often called "land-use parameters"):

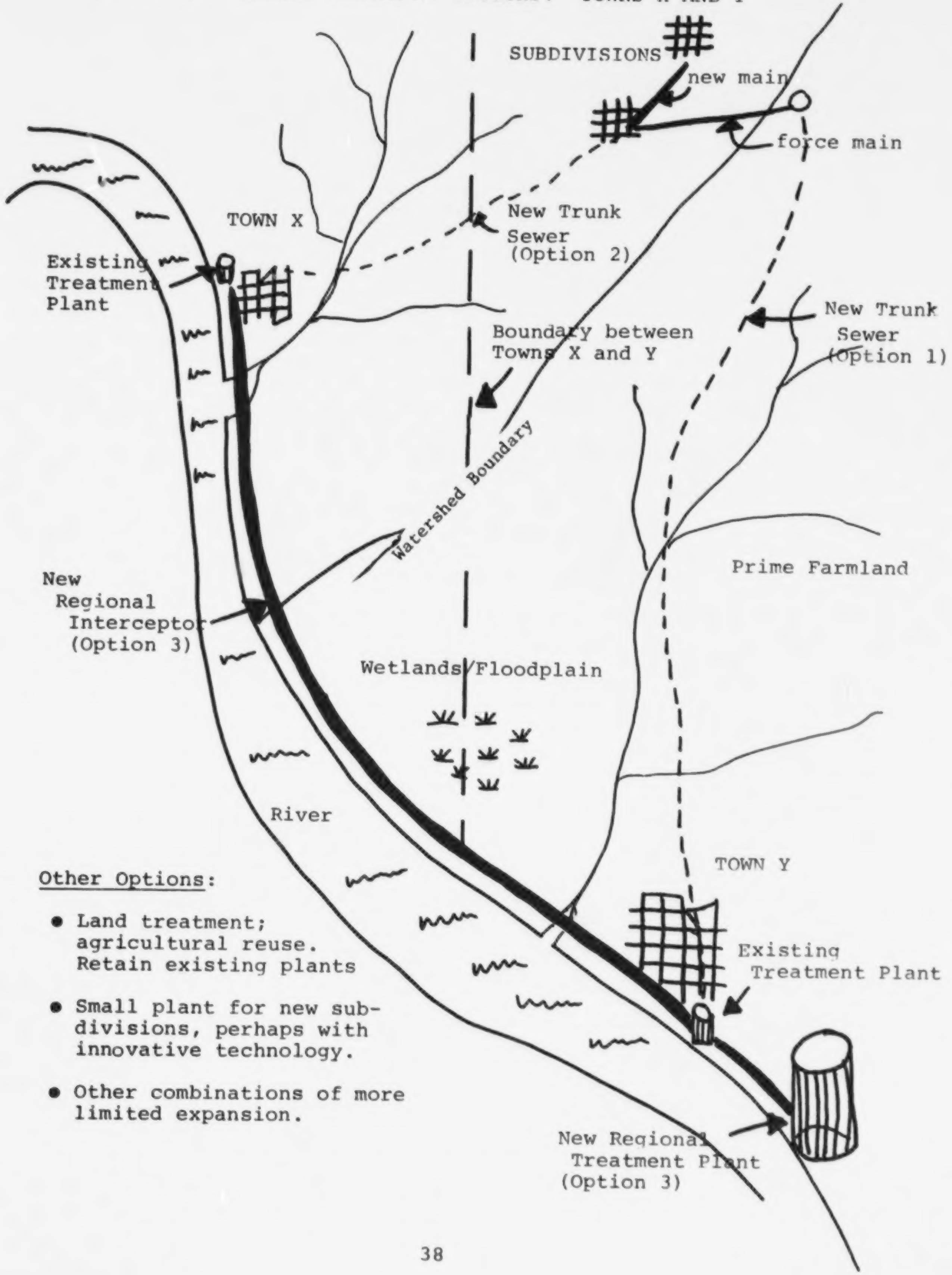
Two riverside towns (X and Y) each have existing developed areas serviced by separate sewage treatment plants (see illustration, p. 30). Located about 15 miles apart, each town is in a separate watershed. Local streams are prized for their high water quality. But Town X, which is upriver from Town Y, has discovered that the quality of the water in its smaller stream is declining because of subdivisions in the hills of its watershed. Unfortunately these subdivisions are actually within the political jurisdiction of Town Y, which has roughly the same population as X but is much larger in area. The state orders construction of a new treatment facility for these subdivisions both to serve existing housing and to permit new housing construction to proceed. Towns X and Y must also improve the treatment level of their existing plants to a required secondary treatment standard to obtain state discharge permits. The state agency and the EPA threaten enforcement action.

These two communities face a number of choices:

Option 1

Town Y can build additions to its treatment facility to serve the new subdivisions (they have to improve the plant to achieve secondary treatment standards anyway).

FIGURE 1: SEWAGE TREATMENT OPTIONS: TOWNS X AND Y


SUBDIVISIONS
new main
force main
TOWN X
New Trunk Sewer (Option 2)
Existing Treatment Plant
New Trunk Sewer (Option 1)
Boundary between Towns X and Y
Watershed Boundary
Prime Farmland
New Regional Interceptor (Option 3)
Wetlands/Floodplain
River
TOWN Y
Existing Treatment Plant
New Regional Treatment Plant (Option 3)

Other Options:

- Land treatment; agricultural reuse. Retain existing plants
- Small plant for new subdivisions, perhaps with innovative technology.
- Other combinations of more limited expansion.

This will require a force main--a sewer moving wastewater under pressure--to move the sewage from one watershed to another. It will also require a long and expensive trunk sewer line to run to the remote subdivisions, which are actually bedroom suburbs of Town X. The trunk line will cross open space such as farms and environmentally sensitive lands that are served by good roads, and demands for subdivision and development of these areas are likely if the sewer line is put in.

Option 2

Town X can provide service to the new subdivisions. Because the service will remain within a watershed, a combination of gravity mains and the shorter distance the sewage would travel to the treatment facility would reduce the capital and operating costs for providing the new service. The open land between Town Y and its remote subdivisions would not be serviced with sewers, making new development there unlikely. Political and financial agreements between X and Y would be required.

Option 3

The two communities could together build a new regional sewage plant that would be served by a gravity interceptor running along the river. Each of the smaller watersheds could be served by gravity trunk sewers; if the open land between X and Y was needed for development at some time in the future, another trunk could be added to serve this area. Substantial economies of scale might be realized. However, the construction of the regional plant might generate subtle pressure for the development of the open agricultural and environmentally sensitive lands between towns as the two communities seek formulas to recoup the large initial capital costs. One technique to recover the costs that EPA does not reimburse is to service large areas for new construction and to shift costs to the incoming residents as rapidly as possible.

Option 4

Town Y might provide a new small-scale on-site treatment system to service only the problematic subdivisions. Both Town X and Town Y would then improve the level of treatment at their existing facilities providing some additional capacity for orderly development around the towns. Unless these decisions were accompanied by restrictions on further subdivision development in the hills, however, the communities might find themselves in a situation similar to the one they are in now in a few years. In addition, planning for limited expansion of sewage treatment capacity now might well mean the community would have to foot a significant bill for new construction later because once the current construction is completed, additional federal funds might not be forthcoming.

Each of these four options would resolve the water quality problems facing the two communities. Yet, each wold pose another set of problems that the communities would be forced to resolve. The preferred option would obviously depend on specific circumstances.1/

FOOTNOTES - CHAPTER II

1. Adapted from Land Use and the Pipe, Richard D. Tabors, Michael H. Shapiro and Peter P. Rogers, (D.C. Heath & Co., Lexington, Mass., 1976), p. 19.

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CHAPTER III

INSTITUTIONAL ISSUES OF SEWAGE TREATMENT MANAGEMENT

Key Government Influences on the Facility Planning Process

What are the federal responsibilities in the Construction Grants Program? Who are the federal actors?

The *U.S. Environmental Protection Agency*, which administers the Clean Water Act, plays the preeminent role in the Construction Grants Program: It writes regulations and guidelines that interpret the law and award the grants. EPA headquarters in Washington, D.C., takes primary responsibility for interpreting the law, while EPA's 10 Regional Offices throughout the country have primary authority to award Step 1, 2 or 3 grants.

In general the Water Division of each Regional Office has one branch mainly concerned with municipal facilities or engineering and another, separate branch for water quality planning standards. Facility planning under the construction grants program is usually not the responsibility of the water quality planning branch but of the municipal facilities branch, which is primarily staffed by engineers. Coordination and communication between these two branches varies from region to region. Typically, there is a constant struggle for information within them , a struggle that often flares up into a pitched battle between engineers on one side and planners and lawyers on the other. Engineers typically view concern for environmental issues as a delaying tactic; planners and lawyers accuse the engineers of running roughshod over ecological objectives. Power usually resides with the branch that control the flow of information.

Public Participation Offices. As a concerned citizen you should find out whether there is a Public Participation Office in your Region. Most Regions do not have such a separate office; public participation is buried in EPA's Office of Public Awareness, whose primary duty is to educate the public about the Agency's mission. A few regions do have personnel who are directly responsible for stimulating and supporting public participation in the 208 (areawide) planning programs, as well as the 201 facilities planning programs.

EPA documents. EPA publishes three kinds of documents that direct and guide EPA personnel, state agencies and local grant applicants. First, *regulations* are proposed for public comment and then issued in final form in the Federal Register (Fed. Reg.), which is published daily by the Superintendent of Documents, Government Printing Office, Washington, D. C. ($50 for annual subscription). EPA regulations also appear under Title 40 of the Code of Federal Regulations (CFR), an annual

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Portions of this chapter have been adapted from manuscript by Barbara Reid Alexander.

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compilation of all regulations in final form (also available from the Superintendent of Documents). Each Title includes a number of Parts, each of which addresses a specific subject.

These regulations have the force of law. The key regulations that apply to the municipal facilities planning program include the following:

Regulation	Purpose
Municipal Wastewater Treatment Works, 40 CFR Part 35, Supart E [Grants for construction of Treatment Works, 43 Fed. Reg. 44022-44099, Sept. 27, 1978.] Public participation in the Construction Grants Program [Cleared by the Agency, but not yet published as we go to print. When published, these regulations will amend Part 35. These requirements should be promulgated in late January or early February, 1979.]	Comprehensive regulations for construction grants program. Describes conditions that must be met prior to award of federal funds; minimum content of facilities plan, requirements for cost-effectiveness and analysis, funding innovative and alternative system and individual systems, state priority lists and set-aside funds, requirements for architectural and engineering subagreements, and the specific public participation requirements applicable to the Construction Grants Program.
State and Local Assistance 35 CFR Subpart F. State Management Assistance Grants [43 Fed. Reg. 42251, Sept. 20, 1978.]	Implements Section 205(g), providing funds to states for management of Construction Grants Program.
Secondary Treatment Information, 40 CFR Part 133, [38 Fed. Reg. 22298, Aug. 17, 1973, Amended on Oct. 7, 1977.]	Defines effluent limitations for the minimum national requirement of secondary treatment.
Water Quality Management, 40 CFR, Subpart G [proposed on Sept. 12, 1978, 43 Fed. Reg., 40742-40757. Not yet promulgated in final as this book goes to print.]	Defines contents of State/EPA Agreement regarding water quality management requirements of Sections 106, 208, 303 and 201(g).
Preparation of Environmental Impact Statements, 50 CFR Part 6, [40 Fed. Reg. 16811-6827, Apr. 14, 1975.]	When and how to prepare an Environmental Impact Statement for waste treatment facilities.

Public Participation in Water Pollution Control, 40 CFR Part 25. [Although cleared for publication as we go to print, these regulations have not yet been promulgated in the Federal Register.]	Describes general requirements for pubic participation for all EPA water programs. Reg.

EPA also publishes guidelines, which are not compiled in any official way and do not have the force of law. They give advice on desirable procedures and efficient methods and criteria. Four of these documents have important impacts on the Construction Grants Program:

Guidelines	Purpose
Guidance for Preparing a Facility Plan Revised, May 1975, Municipal Construction Division, Office of Water Programs, EPA, Washington, D.C. 20460	Suggested topics, outline and data necessary for a facility plan. Now being revised.
Model Facility Plan for a Small Community, Sept. 1975.	
Guidelines for State and Areawide Water Quality Management Program Development, Nov. 1976.	Details on the contents of a 208 plan. Now being revised.
Alternative Waste Management Techniques for Best Practicable Waste treatment, MCD-13, Oct. 1975.	Defines the acceptable options for achieving BPWTT.

Many other guidelines cover technical aspects of the waste treatment program and contain valuable information on alternative waste treatment management systems. They are all available from your EPA Regional Office.

The third category of program development documents come in the form of Program Requirements Memoranda (PRM). These are policy and operation memoranda in the form of directives to EPA Regions, but also are made available to others involved in the Construction Grants Program (available from your EPA Regional Office). They are usually not advertised widely. PRM's are important because they often interpret significant issues raised by the regulations. PRM's are identified by a two-digit prefix that signifies the fiscal year in which they were issued and are then numbered sequentially (e.g. PRM 77-1 is the first memorandum issued in the fiscal year 1977).

It is not necessary that you be intimately familiar with all of these EPA documents before you participate in facilities planning. However, the overview of their contents provided in this manual may prove useful. You then can refer to regulations and guidelines when you need: (1) to learn more detail about an aspect of facilities planning that is of particular interest to you, or (2) to quote a source to give greater weight to your suggestions at the local level.

What are the state responsibilities in the construction grants program? Who are the state actors?

The state water pollution control agency has a powerful role in the sewage treatment program. Local officials probably will deal primarily with representatives of this agency in preparing and conducting sewage treatment plans. Its organization, of course, varies widely, but may reflect the EPA Regional Office with which it deals. It is usually dominated by engineers. The relationship between those with responsibility for facility planning and those responsible for 303(e) and 208 planning is crucial. As with EPA offices, state agencies commonly treat the 201 facility plan as a part of the Construction Grants Program, not as part of water quality planning.

The state's responsibilities in the facility planning process are vital. Besides formally managing the Construction Grants Program (see the description of the state's new authority below), the state water pollution control agency establishes the Priority List, which determines when and how much money the local communities receive. The state also establishes water quality standards for specific bodies of water and has a role in determining the geographic boundaries of the 201 planning ning area and establishes water quality standards for specific bodies of water. As is discussed in Chapter IV, the states also have been given new responsibilities for establishing population projections in specific facilities planning areas.

Furthermore, each state must approve a community's application for a facility planning grant before it can be submitted to EPA, and must approve the completed plan itself prior to EPA review. In fact, the state actually transmits the grant application and completed facility plan to EPA. During its own review, the state must certify that the plan conforms with any applicable 303(e) basin plan or 208 waste treatment management plan. Thus, the power of the state water pollution control agency to determine the timing and direction of facility planning is enormous.

How has recent legislation increased the authority of state water quality agencies in managing the construction grants program?

The Clean Water Act Amendments of 1977 call for greatly increased state involvement in the Construction Grants Program. Historically, EPA has retained responsibility for certifying that all requirements of the Act and the regulations have been met before funds are awarded for Step 1, Step 2, and Step 3 grants. But the new amendments--recognizing EPA's limited resources and the desire of several states for more control over the program--contain both authority and money for a potentially major change in the Construction Grants Program: Each state now can negotiate an agreement (termed the "Delegation Agreement") with its Regional Administrator to take over management of major parts of the Construction Grants Program and to receive a federal Construction Management Assistance Grant (CMAG) to assist its own management effort. (A maximum of 2 percent or $400,000, whichever is greater, is now available from each state's construction grant allotment for this function.) The Clean Water Act of 1977 contains not only explicit authority for this delegation but also a new policy directive on the subject:

> It is the policy of Congress that the States manage the Construction Grants Program under this Act and implement the permit programs under Sections 402 and 404 of this Act. [Section 101(b)]

You should be aware of how your state seeks to increase its authority over the program.

State management of the Construction Grants Program will be accomplished through a separately negotiated Delegation Agreement between the state and EPA. (This agreement will form part of the State/EPA agreement described in Chapter I.) Responsibilities transferred by these agreements will range from relatively straightforward engineering management, such as inspection of on-site construction and review of required operation and maintenance manuals, to the more complex requirements of facilities planning. The state agency may, in fact, be called on to certify the adequacy of such critical components of Step 1 planning as innovative and alternative technology evaluations, cost-effectiveness analyses, public participation programs and environmental assessments.

Once EPA has officially delegated such authority to a state, the Regional EPA office is required to accept that state's certification that a particular requirement has been met (unless the Regional Administrator has positive reason to believe a certification is faulty).

Several functions cannot be delegated, however. These include determining the need for and preparation of Environmental Impact Statements (under the National Environmental Policy Act of 1969) and the actual awarding of funds for Step 1, Step 2, or Step 3 grants. In fact, EPA may also decide that a particular project requires special attention from its staff.

Because EPA retains authority over undelegated functions as well as bottom-line responsibility to sign grant awards, it is likely that EPA has residual legal liability under Clean Water Act provisions for citizen suits if there is a failure to carry out nondiscretionary duties. The extent of this liability probably will remain unclear until tested in the courts.

How do I know if the delegaton of the Construction Grants Program is an issue in my state?

Delegation of authority to manage the Construction Grants Program is an issue in nearly every state. Even in states where the lead water quality agency has no obvious capability to manage it, it is likely that the EPA Regional Office and the state agency are engaging in quiet discussions concerning what changes must be made so the state can take over.

Given political pressure from the states and Congress, and chronic staff shortages at EPA, it seems likely that many delegations will take place quickly. (EPA's own projections call for more than half the states to receive Construction Management Assistance Grants by October 1, 1979.)

How will delegation of Construction Grants Program take place?

(As you consider the formal steps of state delegation described below, keep in mind that informal steps may be much more important than the formal process. Informal discussions now going on between the EPA Regional Office and the state agency may result in "tentative" decisions from which changes require a heavy burden of proof.)

The delegation procedure begins with a formal agreement between the EPA Regional Office and those states with the capability and desire to manage the Construction Grants Program. The Delegation Agreement specifies which functions will be transferred to the state agency over a 5-year period. All terms and conditions are to be covered including designation of a management agency, staff and budget requirements, scheduling for the assumption of delegated fuctions, and the procedure for EPA reviews.

Once the Delegation Agreement is completed, the Construction Management Assistance Grant (CMAG) may be awarded. Both the completed agreement and the CMAG may be amended and extended at any time.

Public Involvement. Newly issued EPA regulations require public involvement during the negotiation of Delegation Agreements and any substantial amendments to them. Actual copies of draft delegation agreements (and substantial amendments) and fact sheets are to be distributed to the 45 days before approval, and, if there is significant public controversy, a hearing must be held. The public is specifically asked to consider whether the state program is adequate to the proposed delegations.

The State of California was the first state to receive comprehensive authority from EPA to review and approve the full spectrum of functions under the federal wastewater grant program. The first stage was a memorandum of agreement signed in 1972; formal delegation was begun in 1975. From 1976 to 1978 more than 18 separate subagreements were prepared to outline how the state would implement each certification and review function.

Under the California agreement, only the state agency reviews the Step 1 application--the facility plan itself, project reports, plans and specifications and operation and maintenance manuals. During that review the state fills out checklists to document to EPA that required procedures, regulations and laws have been followed. The state then certifies to EPA that proposed projects are acceptable for Step 1, 2 or 3 grant awards. Only the checklists are reviewed and signed by EPA, which formally awards the grant. The state does all the paperwork to prepare for the grant awards; the state agency essentially is acting in place of EPA staff.

Will this management transfer do anything more than just eliminate duplication and transfer the paperwork from the EPA Regional Office to the state capitol? Obviously, the answer to this question will depend on: 1) the competence and training of state personnel; 2) the degree to which EPA will scrutinize and respond to signs of problems raised by grantees or by concerned citizens; 3) the amount of political pressure exerted by the state on EPA to delegate quickly or comprehensively; 4) the contents of the Delegation Agreement itself and how it handles protests and disagreements between the state and the grantee or the state and a citizens group.

CMAG regulations call for mid-year and end-of-year evaluations of the state's program before the CMAG grant can be renewed. The Regional Administrator must hold a public meeting to assist the end-of-year evaluation. Presumably, this evaluation will condition and affect new grants for the coming fiscal year.

The delegation agreement for the Construction Grants Program is intended to be one subpart of the broader State/EPA Agreement described in Chapter I. Because State/EPA Agreements have not yet been negotiated and adopted, CMAG regulations require that the State/EPA Agreement be well enough developed in fiscal year 1979 to allow a Delegation Agreement to be consistent with it. By fiscal year 1980, state programs funded under CMAG will be part of the State/EPA Agreement and that agreement must be completed before execution of new Delegation Agreements.

CMAG's generally will track the beginning of a new fiscal year which starts October 1. Citizens who wish to be involved in end-of-year evaluations should expect such proceedings to occur in late spring and early summer. Most actual grant activity will probably take place in the fall.

What affect will the Delegation Agreement and the CMAG have on my involvement in facilities planning?

Once a program function has been delegated to a state, EPA generally will accept the state's certification that a local facilties plan meet a particular federal requirement. The state agency will be the court of first (and sometimes last) resort for your appeal if you consider the local public involvement program, the environmental assessment, or the local assessment of alternative technologies to be inadequate. Although you may appeal disputes to the EPA Regional Office, EPA will find it increasingly difficult, for political reasons, to step into a local/state issue.

Key Questions to Ask

Here are some key questions you may ask of both your state agency and EPA Regional Office:

1) Are the engineers in the municipal facilities branch of your EPA Regional Office sensitive to environmental early warning signals?

2) How does the planning and standards branch insert its comments into the internal review of proposed Step 1 grants?

3) Are the comments of the planners given serious consideraton?

4) One of the key indications of conflict or cooperation relating to a specific Facilities Plan might be found in the special conditions inserted in the Step 1 grant prior to EPA approval. Are the comments and issues raised by the water quality planners included?

5) The relationship between the regional construction grants office and the environmental impact office (which is usually separate and reports directly to the Regional Administrator) also becomes crucial. Who determines the adequacy of the environmental assessment in the facility plan and the need for an Environmental Impact Statement?

6) Do planners, ecologists and biologists have any responsibility in the facilities planning process? Is their responsibility a direct one or only for review and comment?

7) What is the relationship between the construction grants personnel and those responsible for reviewing local 208 plans?

8) Does your water pollution control agency act as a whole, or do specific personnel have stated biases with regard to alternative waste treatment systems?

9) Is there a state policy to fund innovative systems or a history of preferring small community septic systems when appropriate?

10) What is the present status of the delegation of the Construction Grants Program to your state agency? Does the state intend to work toward a complete delegation of the program as in California?

11) When will a memorandum of agreement be signed between the state and EPA to begin the process of delegation? What areas of authority will the state begin to take over first?

12) Will a public hearing be held prior to official delegation?

13) What role will EPA play when potential disputes occur and problems are raised by members of the public?

14) What provision has the state made for compliance with the public participation requirements of the Clean Water Act? Does the Delegation Agreement mention this important issue? Will EPA require a full-time public participation specialist at the state agency?

What is the local role in the facility planning process? Who are the local actors?

The local applicant for federal construction grant funds for a Step 1 planning grant has the responsibility for producing the actual document, "Facilities Plan for (your area)". It is the local responsibility to hire an engineering consultant if necessary and to make the important decisions required by the Clean Water Act and EPA regulations, such as: Should septic systems now serving an area be replaced with sewers? Which kind of treatment alternative best serves the community needs and the national effluent limitation prescribed as BPWTT? Where should the treatment works, if any, be located? What open space and recreational concerns can be built into the plan? What secondary environmental impacts will result from the proposed treatment works? Subsuming all these questions, how much will the preferred alternative cost the town as a whole and the individuals served by the system?

When it comes time to apply for a Step 1 planning grant, concerned citizens should know who the official grant applicant is. Unless it is a large urban area, chances are the applicant will not be able to afford to hire specialists to review plans and deal with state and federal agencies with a high degree of technical expertise. These jobs, then, will most likely fall to non-expert "generalists"--local officials.

The official applicant may be local elected officials such as selectmen, mayors or town councils. Whether these officials in your community are full-time professionals or basically volunteers will indicate much concerning the amount and quality of time they will devote to facilities planning. Find out who has supervisory responsibility. Overworked officials may have little time to devote to overseeing the planning effort; an interested member of the planning board or conservation commission might play the important role of coordinating the flow of information to key local personnel.

If a special district has been formed for sewage treatment planning and construction, the official grant applicant is the Sanitary District Board, Sewer Commission or Water District, whose directors or trustees may or may not be elected. If the geographic scope of the Facilities Plan crosses political boundaries, two or more jurisdictions may apply jointly or one of several communities may act as the lead agency.

In these cases, there is a danger that local officials might consider that the problem "has been taken care of" and thus feel little need to get involved. Even a cursory look at the issues involved in sewage treatment planning should convince you that this is not so. Local officials have a large stake in growth and environmental impact issues. Before assuming "it has been taken care of," investigate backgrounds and interests. How do the functions of the special district relate to those of your local government, especially planning, zoning and other environmental functions?

In almost every case the local grant applicant hires an engineering consulting firm to actually conduct the facilities planning process. Although consultants are nearly always engineers, individual firms may vary greatly in their ability to bring to bear other points of view. The local grant applicant acts alone in hiring the consultant, though state and federal EPA offices may offer a list of available firms upon request.

If the relationship between applicant and consultant proves to be amicable, the same engineering firm is often chosen to design and construct the recommended waste treatment alternative. This is not a requirement, however, and some have argued that hiring the same firm for planning and construction may be detrimental to the process. EPA no longer allows the consultant's profit to be a percentage of construction costs, but the fixed fee of the consultant is, of course, based on the scale of the overall system. A conflict of interest may arise when a consultant is asked to evaluate and compare systems of low capital cost and small scale against large centralized regional systems if that consultant is likely to receive a major construction contract.

The consultant's role depends on the contract negoiated with the local grant applicant (town government, special district, etc.), but usually the consultant will be responsible for producing a 201 Facilities Plan document that conforms to EPA and state requirements. How involved the applicant wants to be will determine the degree of responsibility it retains for public participation in the planning process, provision of personnel or certain testing of soils and water, review of the plan in its initial stages, and consultation with other local government boards and agencies. Some of the issues that should be raised with any potential consultant prior to hiring are outlined later in this chapter and in Chapter IV.

Which members of the public will be concerned about facilities planning in the community? All sorts of people and interests: local real estate developers; members of civic action or environmental organizations; low-income families worried about the cost of operating and maintaining a fancy treatment plant; commercial fishermen who want to clean up local shellfish areas; land owners fearful about the location and impact of a sewage treatment facility; local industry; and many others.

In many communities, members of the public have not participated in facilities planning until the plan was complete and the recommendations for construction made to the state and EPA. Massive controversies then ensued that required years of negotiation and investigation to solve problems that could have been handled more easily early in the planning process. The message is clear: Get involved as early as possible.

Your role will depend on the energy and time you devote to the issue. Perhaps you can act as an informal adviser to your town officials; you might want to work closely with the engineer/consultant to conduct public participation programs concerning the planning process. You may want to act as an advocate from a position you hold in local government: conservation commission, planning board, etc.

Whatever your role, remember that you have a right to all the information contained in state, EPA and consultant files and that you have the right to expect compliance with the public participation regulations.

Political Issues Raised by the Construction Grants Program and the Facilities Planning Process

How will Section 208 planning relate to the on-going facility planning process?

Congress intended Section 208 to be the keystone of clean water planning. It was intended to bring about areawide and statewide management plans to clean up existing pollution and prevent future pollution from all point and nonpoint sources in each planning area. Areawide and statewide waste treatment needs would be identified and planned for a 20-year period. These management plans would provide the framework for the more local decisions of the Facility Plan in communities that choose to participate in the federal Construction Grants Program.

Congress emphasized 208 planning by providing for 100 percent federal funding during the first three years of plan preparation: $150 million was authorized to be spent for the first two years. No other planning program of the Clean Water Act received this level and amount of federal funding. However, EPA was worried about the land use implications of 208 planning and afraid to interfere in historically local decisions. In addition, federal budget officials resisted the increased spending: Section 208 was not funded at all by EPA in fiscal year 1973 and only $25 million was provided in fiscal year 1974. It took a court suit to force EPA to even begin requiring and funding statewide 208 planning for the areas outside the jurisdiction of designated areawide agencies. Serious 208 planning efforts were significantly delayed, but are now underway in all states.

A major headache has been brewing since the beginning of serious 208 planning efforts: how to coordinate the final 208 plans with the 201 facilities planning program. If 208 plans are to provide the framework for local Facilities Plans, as the Act intended, then the provisions of 208 plans clearly are crucial to the successful operation of the program. However, these provisions may be quite out of step with individual 201 plans, if only because of the different actors involved. Most 208 planning is done by regional planning agencies or councils of government that have hired professional planners with federal funds. The typical 201 grant recipient, by contrast, is a town government or sanitary district that has hired a consulting engineer to prepare its Facilities Plan. The different perspectives of the planners may bring quite divergent recommendations.

Furthermore, the scope of the two planning efforts is significantly different. Local facility planning is primarily structural in nature; the consulting engineer arrives at a concrete solution (in more ways than one) because federal funds are only provided for treatment "works". Section 208 planning, however, must focus on nonstructural land-use restraints required to achieve good water quality. The 208 planners get no reward for structural solutions.

If the 208 plan fails to be specific enough in its identification of waste treatment needs over the next 20 years, or recommends approaches that are unacceptable locally, trouble may be brewing. There is a mechanism for amending 208 plans--a system of annual review and update called a contining planning process--but it may be complicated, since it requires approval by both the state governor and EPA.

Proposed new policies for coordinating facilities planning and Section 208 planning are described in Chapter IV. They make clear that in the future EPA intends that local facilities planning decisions fit into the framework established by areawide 208 planning: in case of disagreement, areawide planning decisions will prevail.

You should be aware of the status of 208 planning in your area, especially if you live in a region that is under the jurisdiction of an areawide agency. If final 208 decisions have been made and final approval given, your facilities planning may be constrained in important areas by the approved 208 plan. Critical issues like population projections, service areas and recommended waste treatment alternatives and locations may have been decided. If so, you should examine how these decisions were reached. If you are unhappy about them, and the 208 plan already has been approved, you will have to seek an amendment to the 208 plan, in addition to working through the Facilities Planning Process.

What has happened to the Congressional goals and and objectives of the sewage treatment program?

A look at some numbers associated with the Construction Grant Program tells the story of a massive federal program.1/ As of August 30, 1978, $19.37 billion was obligated by the federal government for this program. Over 100 grants are being awarded every month. Recent 1977 amendments have authorized an additional $4.5 billion per year for the next five years. Although $4.2 billion was actually appropriated for fiscal year 1979 (and there is speculation that the appropriation for 1980 will be less), almost 7,000 Step 1 grants have been awarded for a total of over $600 million. Over 1,000 Step 3 construction projects have been completed. Communities with a population under 2,000 have received the most grant awards (41.4 percent); communities with a population in excess of 500,000 have received almost one-third of the federal funds.

There are 12,800 treatment plants currently in operation in the U.S.; 6,200 are planned or under construction. Two-thirds of the plants now in operation do not meet the secondary treatment requirements of the Clean Water Act. Over 50 percent of the facilities now in operation require treatment more stringent than secondary to meet local and state water quality standards. Over 50 percent of these treatment plants have less than one million gallons per day flow. Over 91 million people are served by treatment plants which will not meet the 1977 secondary treatment deadline.

Had enough? The Program is a behemoth. However, remains to be done. A 1976 survey of needs turned up the figure of $95.902 billion necessary to meet the requirements of the Clean Water Act (excluding needs for the control of stormwater).

Clearly, the availability of federal funds is the key to the entire program. There are not the funds available at the local and state level to continue this program without federal help. The degree of federal help necessary is often a debated question, but the present 75 percent federal share seems to be here to stay. The 1977 amendments seek to commit the necessary federal funds for the next five years.

What has been accomplishd with the massive federal program? Is this a public works program or a water pollution control and public health program? Is the answer to our pollution problems technical or ecological? Is this an engineer's or a biologist's program? How do the answers to these questions determine the end result: the type of treatment works funded by all this federal money?

Though a large number of projects have been built and are under construction, the program is far behind its initial deadlines.

What do these numbers mean about the ecologically based water quality goals of the Clean Water Act? Hard data on the kinds of treatment facilities built is sketchy at best, but the vast majority of treatment facilities built in the past six years have been centralized conventional systems using physical/chemical or biological treatment technologies. Relatively few land treatment systems have been built. Until recently the funding of individual systems to correct faulty septic tanks was not allowed. Much of the thrust of the Construction Grants Program in rural areas involved sewering those areas and hooking them up to a centralized system.

Centralized conventional treatment systems are often expensive to operate as well as to build. Sometimes requiring large quantities of expensive chemicals and energy, they also require sophisticated and well-trained operators. Since operation and maintenance is a responsibility of the local community and often falls between the cracks as communities face substantial costs and inadequately trained operators, observers have estimated that upwards of 50 percent of currently operational treatment facilities are not meeting to design standards.

The Construction Grants Program is in transition now. One can be hopeful that renewed congressional and EPA attention to land treatment, to other innovative and alternative systems, to cost-effectiveness analysis, to funding of individual systems, and to the special needs of small communities will lead to smaller, more effective ecological treatment facilities more in tune with a given community's needs and capabilities.

What basic political conflicts are raised by the Clean Water Act?

Two continuing and related tensions accompany implementation of the Constructon Grants Program at all levels of government. The first is the continuing tension between facilities planning as a way to find ecological solutions to environmental problems and the Construction Grants Program as a public works program.

An EPA fact sheet published in September 1978 notes that construction grants projects employ about 14,000 people on construction sites and an additional 22,000 off the sites for every $1 billion of total expenditures by federal, state and local governments. Since communities and states contribute at least 25 percent of total costs, each $1 billion committed by EPA results in employment of about 17,930 persons on site and about 27,500 off site.

Recognizing these employment opportunities and faced with meeting strict regulatory deadlines, the major institutional actors--Congress, the states, the sewage treatment industry and EPA--have put great priority on speeding up the rate of obligations of the program (see the next section). Observers of the Construction Grants Program have noted that the political necessity of moving money quickly has higher priority than ensuring the quality of the program. Attempts to upgrade quality, if they may bring delays in the rate of obligatios, are discouraged.

The second major tension of the Construction Grants Program involves management at the local level.

Since 75 percent of planning and construction funds come from the federal government (and perhaps an extra 5-15 percent from state government), local communities have little incentive to worry much about facilities planning. The community's future cost of maintaining and operating the system may be initially obscure and remote.

Furthermore, since the recipient of the construction grant is frequently a group of lay people who have no experience in wastewater management, the job is typically turned over completely to a consulting engineering firm. Three problems often result from this approach.

Many basic wastewater management decisions involve political value judgments of which the community should be a part. These decisions--population projections, land use, housing and recreation opportunities, distribution of the financial burden, effects on environmentally sensitive areas, to name a few--are buried in the engineer's technical jargon and frequently never emerge for public review. By the time the consulting engineer presents the community with a draft Facilities Plan, both the general public and the grantee will find it difficult to uncover these value judgments, strip them of their mystery, and comment on them.

Second, the consulting engineer is likely to be biased by his experience in considering treatment alternatives during the planning process, and perhaps also by his expectation of receiving a piece of the action in the construction project. (And, of course, as a practical matter, if the engineer has designs and specs already on his shelf that he can use in your community, he can cut that part of his costs.)

The vast majority of consulting engineers who design publicly-owned waste treatment works, are people of competence and integrity; however, you must remember that they are only human, and like everyone else their competence for a particular project may be affected by their training, their past experience and their future interests.

Thirdly, a single engineering firm may not have the expertise to meet all the planning requirements imposed by law and regulation. Planning for municipal wastewater management requires training and experience in sanitary engineering, ecology, and planning and expertise in obtaining public involvement. If one consulting engineering firm is made responsible for all construction grant planning in your community, some of the required expertise may be missing.

What Impact Does the Availability and Method of Federal Funding Have on the Construction Grant Program?

It is the rare community that will begin any part of the planning, design and construction of a sewage treatment facility without the assurance of the 75 percent federal share of the cost. (Federal money may not be used to reimburse costs incurred before the grant award except under very narrowly defined circumstances.) Federal limitations on what costs are eligible for 75 percent federal funding thus determine what kind of planning and design will take place and what actually gets built. (See "What will the federal grants program pay for?" in Chapter V.)

It should be noted that the 1977 Clean Water Act clearly linked the enforceable requirements of the Act (in the case of municipalities achievement of secondary treatment or whatever is necessary to meet water quality standards or whatever other requirements are placed in permits), as they applied to municipal treatment facilities, to the availability of federal funds. Municipalities will be given exemptions for failure to meet 1977 and 1983 requirements if one of the reasons for that failure is lack of federal funding.

Federal money is allotted annually to each state on the basis of a prescribed formula. The 1977 Amendments to the Clean Water Act tied grant awards to the congressional appropriations process. In other words, EPA will allot the $4.5-5 billion authorized by Congress in the 1977 Amendments (based on a statutory formula), but that money will not become available until it is actually appropriated by Congress. If funds are appropriated in a lesser amount than the appropriation, EPA may have to reallot the actual money allotment to the states.

Delays in congressional appropriations may well mean delays in the award of construction grants. During the 1976-1977 congressional debates over the amount of a new construction grants authorization, many states actually ran out of construction grant funds. This problem was not solved with the passage of the 1977 Clean Water Act Amendments, but rather with the passage of an appropriation bill some months later.

Once allocated to a particular state, a state's construction grant money is available for obligation within that state for one year beyond the fiscal year in which it was appropriated. After that time unobligated funds are put back into the national pot and reallocated among all the other states. Once reallocated, the funds do not again become available to the state that could not initially obligate them. This procedure creates additional pressure on states and on EPA regions to obligate available funds as quickly as possible. Although a construction grant Priority List (described in detail in Chapter IV) may specify that Community "A" has first priority over construction funds, if Community "A" is not ready to apply for the funds (due to delays in Step 1 planning, delays in guaranteeing 25 percent local share, etc.) the funds are likely to be obligated to the next project that is "ready to go." This "readiness to go" factor is an unstated criterion in determining the state's priorities.

The final grant award for actual construction of a waste treatment facility (Step 3) often takes place years after the approval of a Step 1 grant and plan. Some projects considered approvable several years ago may still be awaiting federal funds for Step 2 or 3 even though local conditions or federal requirements may have radically changed. Many Step 1 plans were completed prior to the 1972 Clean Water Act and in theory must be redone because of the new legislative and regulatory mandates. Often these old sewage treatment proposals are carried along into "new" Step 1 plans with little serious thought about reevaluating alternatives.

Controversies may add years and lots of inflated dollars to a project's life. A call for an environmentally and politically sensitive alternative in a Step 1 plan may trigger the development of an Environmental

Impact Statement. The EIS may recommend a totally different alternative, which could in turn require a new Step 1 plan. Those faced with this history may ask: Is a final decision ever made?

The answer is that there is a constant opportunity for revision during the Step 1 process and afterwards. This is as it should be; otherwise Step 1 planning would be a mere exercise to justify a previously decided result.

One example of the possibilities for revision has been mentioned--the EIS; but other, less formal means are available. Planning boundaries might be narrowed or enlarged. Preliminary cost analysis may reveal that the options chosen for study are too expensive and locally unacceptable, so new alternatives are then studied more closely.

You should hope, however, that the means of revision now going on in Greenville, Maine, is not relied upon in your community. In that community a complex and expensive tertiary treatment plant was built for discharge into a large recreational lake. The plant replaced a system of village septic systems that were malfunctioning. The plant is so expensive the town cannot afford to operate it, and the complex physical-chemical system does not work properly anyway. There was a local outcry about the effects of direct discharge into the lake. Because the plant doesn't work, the town has voted to investigate a new waste treatment system based on land disposal of the effluent. EPA is being petitioned to pay to remove the old system and build the new one. How the town will retire its substantial debt on the old facility is not yet known. Court suits against the engineer and the manufacturer are pending.

To prevent such mishaps in your community, get involved early. A vigorous public participation program can avoid some of these problems.

FOOTNOTES - CHAPTER III

1. "Clean Water: Factsheet," EPA Office of Water Programs Operations, Aug. 30, 1978.

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CHAPTER IV

INTRODUCTION TO STEP I PLANNING

What Does Wastewater Facility Planning Involve?

A wastewater Faciliies Plan (also known as a 201 plan or Step 1 plan) is, in essence, a preliminary engineering plan for a treatment system that is cost-effective, environmentally sound, and politically acceptable.

Its purposes are:

1) To determine and evaluate the alternatives available to a particular community for controlling pollution in order to meet water quality standards;

2) To select the plan that best meets water quality standards and the community's needs;

3) To provide preliminary engineering for the selected plan.

The Facilities Plan also includes an officially-adopted strategy for financing the facility--and it is the first step toward secruing a federal grant for construction.

The goal of the entire Facilities Planning Process is to select the alternative means of managing sewage that meets effluent and water quality goals at the least financial cost to the community while recognizing environmental and social concerns.

What are the Basic Steps to Obtain Federal Construction Grant Funds?

Every engineering project demands advance planning. However, preparation of a facility plan is the necessary first step in a three-step process required for construction of sewage treatment facilities with federal financial assistance. As such, the wastewater facility plan must contain elements not necessarily included in all preliminary engineering plans.

Once a community's wastewater facility plan has been approved by, first, the state water quality agency, and then EPA, Step 2 may be taken: preparation of detailed engineering design plans, specifications, and cost estimates. Step 3 is

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actual construction. As a general rule, EPA will provide 75 percent of the "eligible costs" (see "What will the Federal Government Pay For?" in this chapter) of each of these three steps. When a project is classified as innovative or alternative (see "Special Objectives," this chapter), the federal share may go as high as 85 percent. Many states also offer grant assistance, so that the community share of the total engineering cost may be as low as 5 percent.

The three-step construction grants process basically assures that facilities built with federal funds will be both environmentally sound and cost-effective. The Step 1 plan provides for local, state, and federal review of the planning process at a key point along the road to final construction. It also allows mid-course correction, and offers assurance to both the affected community and the federal officials responsible for grant disbursement that the facility being planned will be a sound one.

As discussed on the following pages, the facilities planning process must include opportunity for public review and input. Therefore, as an interested citizen you should participate in assessing the Step 1 plan, the facility it proposes, and the possible need for plan adjustment before the remaining steps leading to construction are taken.

What are the Controlling Criteria and Standards?

Whatever its service area and size, the facility must be designed to meet a host of treatment and engineering criteria and standards. The following list is not exhaustive--controls vary from state to state, and will be known by your state water quality agency and your community's consulting engineer. This list is intended only as a summary of major criteria and standards. Many of these controls are discussed in more detail elsewhere in this manual.

Federal Requirements

- All publicly-owned wastewater treatment facilities must apply "best practicable waste treatment technology" (BPWTT) by July 1, 1983. BPWTT is determined in a cost-effective comparison of a range of alternative systems (including land treatment systems, treatment and discharge systems, treatment and reuse systems) that produce the desired degree of effluent quality. BPWTT has been interpreted by EPA to require the equivalent of secondary treatment or whatever more stringent treatment level is necessary to meet water quality standards.

- Secondary treatment by July 1, 1977, for all publicly-owned facilities discharging into navigable waters, except for municipalities that have attempted to comply but were faced with extended construction periods, or were unable to secure needed federal construction grants. Deadlines in these cases may be extended on a case-by-case basis up to July 1, 1983. EPA has set national minimum standards for secondary treatment, but may waive them in some cases for discharges into marine waters.

- Each entity owning and operating a public wastewater treatment plant must adopt and enforce an ordinance requiring pretreatment of industrial wastes entering that plant, as a prerequisite to eligibility for federal grant assistance.
- Ordinances must also be adopted to establish a user charge system and to recover that portion of the capital investment required for treatment of industrial wastes (Industrial Cost Recovery).
- Each treatment facility must secure and renew every five years a National Pollution Discharge Elimination System permit, specifying schedules for achieving effluent criteria for various pollutants with enforcement by regular monitoring of the effluent. (These permit programs are operated by the states under a delegation process in about 30 states.)
- Requirements for adherence to federal laws governing contracts, equal employment opportunity, wage determination, freedon of information and other administrative matters.

State Requirements

The state water quality agency, perhaps in cooperation with the state health department, will also have requirements which must be met by the Facilities Plan. These include:

- Effluent criteria in addition to those capacities by EPA.
- Water quality standards and assimilative capacities for water receiving the facility effluent.
- Engineering and construction standards, including design criteria for aeration basins and other facility components, buffer areas around facilities, and fail-safe requirements for mechanical equipment.
- Eminent domain and easement acquisition practices.

Local Requirements

The facility must be built in accordance with all local zoning, building permit, site management, environmental protection, plumbing and electrical codes.

What Special Environmental Considerations Must the Construction Grants Program Address?

Wastewater treatment facilities are subject to all federal laws relating to protection of the environment, governing disposal of solid wastes, and promoting wise land and resource use. The Clean Air Act applies; so does the National Environmental Policy Act. Accordingly, the facility must be designed so as not to impact adversely upon wetlands, critical environmental areas, or shellfish waters (See Chapter I).

Floodplains Management and Wetlands Protection

To implement the requirements of the recent Executive Order (No. 11988, May 24, 1977), EPA has proposed agency policy and guidance for protection of floodplains and wetlands. In terms of the Construction Grants Program, the new policy would require that EPA, before undertaking any action, first determine whether or not the proposed facility will be located in or affect a floodplain or wetland. If potential impacts can be identified, EPA would then conduct a "floodplains/wetland assessment" in conjunction with either an Environmental Assessment or Environmental Impact Statement review process. This assessment is to include a description of the proposed action, a discussion of its impacts and a description of alternatives considered. EPA also would be required to notify the public of any action that has potential floodplain/wetland impacts and provide adequate opportunity for public review.

If there is no practicable alternative to locating in or affecting the floodplains or wetlands, the policy would require that EPA consider ways to minimize adverse impacts on these sensitive areas and to restore and preserve their natural and beneficial values. Once EPA made a decision on the most desirable alternative, it would have to notify the public and produce a statement of findings to explain its decision.

Significant agricultural lands

EPA policy for protection of significant agricultural lands requires, among other things, that specific project decisions involved in the planning, design and construction of sewers and treatment facilities must consider farmland protection. Consistent with EPA cost-effectiveness guidelines, interceptors and collection systems should be located on agricultural land only if necessary to eliminate existing discharges and serve existing habitation. In addition, EPA must see that primary and secondary impacts on this land are identified and that mitigation measures are recommended in Environmental Assessments, in EPA Environmental Impact Statements, and in reviews by EPA through the EIS process of actions proposed by other federal agencies. In all its programs EPA must support and encourage state and local government agricultural land protection programs.

What Are Some of the Special Objectives of Sewage Treatment Management?

Multiple purpose facility

Recreation and open space. As of 1977, the Clean Water Act requires documented consideration of recreational and open space use of properties acquired for wastewater facilities. EPA regulations require that the recreational opportunities of each sewage treatment alternative be evaluated as part of the facilities planning process. Until now, only a few pioneering communities have reaped the potential recreation benefits associated with the millions of dollars' worth of land and water involved in wastewater treatment.

In most cases, recreation agencies have been suspicious of sewage treatment facilities,--and wastewater agencies have not wanted any part of the potential liability for recreational use of their properties. It would seem logical, however, to arrange for joint management of certain wastewater properties: sewer easements can be put to use for stream access, hiking, and bicycle paths; the ponds and reservoirs used for some treatment processes can support fishing and swimming; and land treatment systems can be thoughtfully planned to double as urban open space.

You should recognize that recreational uses of wastewater facilities can help improve the facility's image as an important community asset among the residents of your community. Planning a facility for recreation and open space can sometimes defuse neighborhood opposition to the site selected.

As you get involved in assessing the recreational opportunities of each management or treatment alternative, you should be aware of the constituencies in your community for open space and recreational activities. Recreation groups, civic groups, and urban/poverty groups may have their own reasons to be interested in analyzing recreational opportunities during facilities planning.

EPA allows Step 1 funds to be used during the required analysis of recreational use for each treatment alternative, but Step 2 and 3 funds may not be used to design or implement such use. Citizens interested in this part of the program will have to seek other resources to realize recreation plans. Local recreation and parks departments may provide technical assistance to the required Step 1 analysis. Their early involvement may ensure implementation, since they may know of community, state, and federal resources available to help pay for recreational use of sewage facilities.

Integrated Recycling/Reuse Facilities

In 1972, the Clean Water Act exhorted the EPA Administrator to encourage waste treatment management facilities that are integrated into other industrial and municipal waste management facilities "including . . . solid waste and waste heat and thermal discharges." EPA is currently considering a new funding policy for these multiple purpose projects that utilize treatment systems that qualify as alternative or innovative.

Energy reduction

Increasing attention is being given to the energy budgets of wastewater treatment facilities. Some plants constructed in the recent past have proven to be high energy consumers--using electricity or oil to run pumps, drive treatment processes, and incinerate sludge. Public policy and economics are now focusing new attention on low-energy processes, sewage digestion methods that produce gas to be burned for heat, techniques to combine sludge and solid wastes for burning to produce electricity, and working solar energy into wastewater treatment technology. The Clean Water Act of 1977 requires the EPA Administrator to encourage energy-efficient waste management alternatives.

Water conservation

The Clean Water Act encourages the reclamation and recycling of wastewater. Its 1977 Amendments give new life to water conservation measures. The reserve capacity (to serve future needs) of treatment plants may only be calculated after efforts to reduce the flow of sewage and unnecessary water consumption have been taken into account. (See Chapter V for EPA implementation through cost-effectiveness guidelines.)

Innovative and alternative technologies

Concern over the large number of expensive conventional, centralized secondary treatment and discharge facilities led Congress to place new emphasis on nonconventional systems in the Clean Water Act of 1977.

EPA guidelines published on September 27, 1978 attempt to define innovative and alternative technology. Essentially, alternative technology is defined as anything other than a centralized conventional treatment and discharge system using biological and physical/chemical unit processes. Innovative systems are systems that have not "been fully proven under the circumstances of their contemplated use and represent a significant advancement over the state of the art in terms of meeting the natioal goals . . ."2/ Criteria that the regional administrator must use in reaching a determination of innovation include:

- cost of 15 percent less than the most cost-effective other alternatives;
- reduction by 20 percent of net energy requiremnts for alternatives;
- improvements in operational reliability;
- better toxic materials management;
- increased environmental benefits; and
- improved joint municipal/industrial management and treatment.

Several provisions of the Clean Water Act can be expected to have a significant impact on the type of treatment systems that are funded.

First, after September 30, 1978, no construction grants may be awarded unless innovative and alternative systems have been studied. The 1977 Clean Water Act defines such systems as those "which provide for the reclaiming and reuse of water, otherwise eliminate the discharge of pollutants and utilize recycling techniques, land treatment, new or improved methods of waste treatment management for municipal and industrial waste (discharged into municipal systems) and the confined disposal of pollutants . . ."

Second, a special reserve fund--2 percent of a state's total yearly construction grant in 1979 and 1980, 3 percent in FY 1981--must be set aside for bonus grants to be made available for construction of innovative and alternative treatment systems. This bonus raises the federal share of the approved treatment works from 75 percent to 85 percent. (The "bonus" grants are authorized for only three years--through FY 1981.)

Another special provision allows that, when comparing the life-cycle costs of different treatment systems, a so-called innovative and alternative system may exceed the costs of a conventional system by as much as 15 percent and still be eligible for federal funding.

As additional incentives for innovative and alternative technologies, states may include them as a criterion for priority funding (See "The Priority System" in this chapter), and communities that invest in approved innovative systems that fail may find that 100 percent of their investment is protected by federal guarantees if the failure occurs during the first two years of operation.

The guidelines for funding of innovative and alternative systems are flexible. The EPA Regional Office, or the state if authority has been delegated, decides on a case-by-case basis whether a system is innovative or alternative.

EPA has ruled that the bonus grants for innovative and alternative systems may only come out of the innovative and alternative set-aside. (If the system is for a small community, the first 75 percent of the federal share may come out of the small community set-aside.) If a large number of new projects meet the criteria for innovative and alternative, it is possible there will be insufficient funds to pay the intended 85 percent federal share for all eligible projects.

The special reserve for innovative and alternative systems is only authorized for three years. EPA has ruled that innovative and alternative systems must be eligible for federal funding in a given fiscal year and will be funded in chronological order of grant application. If only a part of a project is innovative and alternative, only that portion of the project attributable to an innovative and/or alternative system will be eligible for the 10 percent bonus grant.

Special attention to the concerns of small communities

During the 1977 debates over the Clean Water Act, Congress paid particular attention to the problems of small communities in meeting goals for municipal facilities. Communities with populations under 25,000 and a planned facility costing less than $2 million ($3 million in states with unusually high construction costs) may submit a combined application for Step 2 and Step 3 in order to speed up construction, cut administrative costs and reduce the inflation of construction costs caused by delays. In addition, EPA is authorized to provide direct technical assistance to small communities with qualified innovative and alternative systems.

For the first time, individual systems such as septic fields are eligible for federal grants under certain conditions. These small systems are considered alternative to conventional treatment under the definition of "innovative and alternative" and as such, they are not eligible for a bonus grant from the innovative and alternative "set-aside." Individual systems may not receive the 15 percent cost preference in the cost-effectiveness analysis to which other innovative and alternative systems are entitled. They are also eligible for the 75 percent federal funding available through a special reserve fund set aside for alternative systems for small communities. Since states with populations that are 25 percent or more rural must set aside 4 percent of their annual allotment for alternative treatment systems for small communities, that alone should provide some special incentives for funding individual systems.

What Will the Federal Government Pay For?

The entire facilities planning process and subsequent parts of Step 2 are directed toward answering this complex question. As a general rule, the 75 percent federal share can pay for all reasonable Step 1 costs--including, but not limited to, engineering data, analysis of alternatives, environmental assessment, public participation activities and recreational planning for a facility that is appropriately eligible on the state Priority List (see "The Priority System" in this chapter). These costs are outlined and approved in a proposal called a Plan of Study submitted to the state water pollution control agency and EPA before the grant award.

The budget for Step 1 planning is negotiated on a case-by-case basis before the grant is awarded.

Each state is required to reserve 5 percent of its annual allocation for possible increases to ongoing grants, which may be awarded while Step 1 planning is underway. The vehicle used for this increase is a grant amendment that is first submitted and approved by the state agency and then sent to the EPA Regional Office.

Funding eligibility for Step 2 (the design phase) and Step 3 (actual construction) is largely determined by the outcome of Step 1. Federal funds will pay for design and construction of the least expensive treatment alternative that meets required effluent limitations without generating over-environmental and social impacts. A number of quite specific requirements (described in Chapter V) establish the parameters of the so-called cost-effectiveness analysis, which results in the selection of a preferred alternative, its technology, its size and its service area.

The federal government will not pay for:

1) a facility that is larger than necessary for anticipated present and future wastewater volume, as determined by established procedures;

2) a facility designed solely to meet community expansion needs rather than existing water quality needs;

3) ongoing administrative activities of local government. Grant funds may be used, to pay the expenses of staff who are actually producing work for Steps 1, 2, or 3 (i.e., the cost of a grantee construction crew may be eligible for federal funding), but may not be used to pay the mayor's salary; and

4) sewage treatment plant site acquisition.

Some special cost eligibility considerations are worth paying attention to here.

1) A new or improved and expanded treatment facility built primarily to treat domestic waste is eligible for federal funding. Industrial waste may be treated at the facility, but the proportionate capital outlay (less interest charges) is paid back through an industrial cost-recovery system.

2) Federal funds may only be used to pay for the most cost-effective system that meets the enforceable requirements of the Clean Water Act. As has been noted previously the 1983 BPWTT standard has been defined as secondary treatment (or its equivalent) or whatever more stringent treatment is necessary to meet state water quality standards. This means that federal grant funds may not be used for treatment more stringent than secondary unless state standards require such treatment, or unless the treatment system resulting in a higher degree of treatment is, in fact, the most cost-effective system to meet the secondary treatment minimum.

Recent concern over the high incremental costs of treatment beyond secondary have led the Congress and EPA to adopt new policies that may make it more difficult to construct sewage treatment facilities that go beyond secondary treatment standards. In approving the fiscal year 1978 Construction Grants Appropriation, the Congressional Appropriation Conference Committee directed that the EPA Administrator personally approve advanced treatment for all projects in which the incremental costs of such treatment exceeds $1 million. The Administrator must make a definitive finding that such treatment will result in "significant water quality and public health improvements."

Basically, EPA policy will be to take a hard look at all such projects. Before they may be funded, they must undergo rigorous financial analysis and their benefits must be determined to be significant. If an advanced treatment project involves innovative and alternative technology, its projected costs must exceed secondary treatment costs by 25 percent before it is subjected to the rigorous cost-benefit analysis of other advanced treatment projects. The analyses required by EPA Regional Offices are to be forwarded to EPA headquarters for the Administrator's approval.

Because determinations concerning "significant water quality and public health improvements" will have to be made on a case-by-case basis, considerable confusion about what kinds of projects are eligible for federal funding is to be expected.

3) Necessary interceptor sewers that are part of the

recommended cost-effective alternative are eligible for federal funds. Generally speaking, new collector systems serving communities built after 1972 are not eligible. (The test for what constitutes an existing community is based on population density.) Rehabilitation of sewer systems may be eligible if that is cheaper than adding treatment capacity. If the sewers to be rehabilitated are house connectors located on private property, they will not be eligible for a federal grant.

4) The cost of land is eligible only if it is land used for wastewater storage prior to land treatment, or if used as part of the treatment system.

5) As mentioned previously, individually-owned and operated systems may be eligible for federal funding if that alternative proves to be the most cost-effective.

To be sure that funding of individual systems does not give a windfall to certain private homeowners, funds used for individual systems are subject to a number of additional limitations. Some of these limitations are:

- acquisition of land is generally not eligible for federal funds, as it is presumed that the homeowner already owns the land;
- the only portion of the wastewater generating fixture that is grant-eligible is the residue disposal mechanism;
- site improvement beyond preconstruction conditions is not grant-eligible.

Individual systems may be considered innovative and alternative systems and therefore eligible for the 10 percent bonus grant allowed those systems. They may not, however, be given the 15 percent advantage in the cost-effectiveness determination. In order for individual systems to be eligible for federal funds, a public body must make application for those funds, and must certify that the individual systems will be properly operated and maintained.

6) Multiple-purpose projects are currently eligible for federal funding only to the extent that they are the most cost-effective alternative designed to meet water quality standards. While planning for recreational use of facilities is required (and in fact, is eligible for Step 1 planning funds) neither the design, nor implementation

(purchase of surface easements, etc.) are eligible for construction grants funds.

EPA is currently considering a new policy for multiple purpose projects that use innovative and alternative treatment systems. If a multiple purpose project meet certain specified conditions, the portion of the total multiple purpose package (pollution control plus utility cooling system, for example) that would be eligible for construction grant funds would be calculated according to the following formula:

- divide the total cost (capital costs plus operation and maintenance over the entire project period, expressed as present worth--see Chapter V) of the most cost-effective single purpose pollution control option, by the present worth of the most cost-effective multiple purpose option;
- multiply the resulting quotient by 115 percent. The fraction obtained by this formula is the portion of the multiple purpose project which is grant eligible.

Because in some multiple-purpose projects the amount of federal funds the project would be eligible for will be less (if by combining a water quality function with another function, the total cost of the water treatment function declines), a minimum level for grant eligibility will be 115 percnt of the capital cost of the most cost-effective pollution control option. (Such multiple-purpose projects as those that combine recreational use and water pollution control will continue to fall under the old policy.)

In other words, for multiple purpose projects using innovative and alternative systems, some of the cost of the parts of the project that are not related to water quality needs may be covered by federal assistance from the Construction Grants Program.

What Are the Earliest Opportunities to Influence the Direction of the Step 1 Plan?

Decisions made by nonlocal actors

Before a community begins facilities planning, a number of constraining decisions may have been made through the statewide water quality management process: amount of allowable discharge, boundaries of the facilities planning area, and population projections. These decisions are to be made by state agencies or by designated areawide waste treatment management agencies (see Chapters I and III). In fact, according to new EPA regulations these critical decisions must appear in approved Water Quality Management plans. After October 1, 1979, EPA will generally not approve grants for Step 1 planning unless the related information is available in an approved WQM plan.

Establishing effluent limitations

The municipal effluent limitation is the specified amount of pollution a community may discharge into surface waters. These limits are expressed in terms of the amount of or concentration of pollutants that may be discharged into receiving waters (i.e. amount of biological oxygen-demand material (BOD) that may be discharged per million gallons per day (mgd) of wastewater, or miligrams per liter (mg/l) of suspended solids (ss)).

Effluent limitations are essentially derived from these sources. First, all municipal discharges (with one exception to be described later) must meet a minimum national standard of discharge, which is defined as the level of discharge that can be expected from a well-operated secondary treatment facility.

Second, if the equivalent of secondary treatment is not sufficient to meet state water quality standards for a particular body of water, a stricter standard requiring higher degrees of pollutant removal may be established. This level of treatment may be expressed in terms of percent of pollutants removed, up to 100 percent.

Third, if a facility discharges into marine waters, the EPA Administrator may (under conditions specified in the 1977 Amendments) allow a variance from secondary discharge requirements.

It is relatively easy to find out which effluent standards apply to a community with an existing sewer system and untreated (or undertreated) discharge. The permit issued under the National Pollutant Discharge Elimination System will require effluent limitations based either on a minimum of secondary treatment or on state water quality standards, whichever is stricter.

It is more difficult to find out which effluent limitations apply when a community has no existing publicly-owned discharge (i.e., no sewers or treatment plant), and therefore no NPDES permit to dictate minimum treatment levels and cleanup schedule. A state-issued permit or abatement order or an approved WQM plan may then be the place to look for effluent limitation requirements.

Establishing Planning Boundaries

Your state's water quality agency will usually determine the planning area for Step 1 grants in consultation with local officials or in the contents of a completed WQM plan. A completed WQM plan must assign an agency to manage planning and construction of waste treatment facilities. The assignment may go to an areawide agency, or the authority may be delegated to the individual jurisdictions in the area.

In the absence of a completed WQM plan, the state water quality agency has authority to establish the local 201 planning boundaries. The boundaries must include the source of the pollution problem itself; how much other area is also included may directly influence the contents of the Facilities Plan itself.

Consider the following scenario:

> A small village has malfunctioning septic systems. Two nearby villages have the same problems. The entire area is subject to growth pressures. A large urban area has a modern secondary treatment facility nearby.

Now, if the 201 planning area is limited to the first small village and its political boundaries, certain small-scale treatment options become viable. If planners define the 201 planning area to include all three small villages, a more centralized treatment option probably will be considered. And if the three villages are annexed to the urban area planning district, or join the urban sewer district, a vast treatment system becomes an obvious treatment alternative.

The selection of treatment boundaries in cases like this obviously can tell you a great deal about the preliminary thinking of the state waste treatment planners.

EPA regulations and guidelines offer some guidance to those who draw these planning boundaries. First, the geographic area must be large enough to assess all potential environmental impacts of any treatment alternative chosen. It must, for example, include the entire area that might be affected by secondary impacts brought brought on by sewer induced growth. Second, it must be large enough so that cost-effective alternatives can be considered--a requirement often seen as a way to enlarge planning areas to allow study of regional solutions. In fact, EPA regulations specifically require that "appropriate attention should be given to including the entire area where cost savings, other management advantages, or environmental gains may result from interconnection of individual waste treatment systems or collective management of such systems." (40 CFR 35.917-2(a)(1))

Although it is the state's job to draw planning boundaries, local officials must be consulted. In addition, EPA has the right to change boundaries (after consulting with local and state officials) on the grounds that the geographic scope of facility planning should be limited to the extent necessary to assure that subsequent grant awards will be cost-effective and environmentally sound.

Boundary selection has political and legal implications that you and your local officials should be aware of: Planning boundaries larger than your town's own borders may involve you in a tug-of-war with more powerful nearby communities. A small town can easily lose control over selection of treatment alternatives if it becomes part of a larger sewer district.

Planning area boundaries are distinctly different from and broader than service boundaries discussed later in this chapter and in Chapter V. Yet, the drawing of planning boundaries before the facilities planning process begins may in fact establish the basic outlines of service areas.

Statewide disaggregation of population projections

The states are responsible for disaggregating (breaking down) statewide population projections in facilities planning areas (See Chapter V). The statewide disaggregations are to be submitted to the EPA Regional Administrator before October 1, 1979, and each subsequent year thereafter, and are to be presented before a public meeting for discussion before they are submitted to EPA for approval.

How Does a Community Establish Initial Eligibility For a Federal Grant?

The priority system

No Step 1, 2 or 3 grant can be awarded unless the state certifies to EPA that the project in question is entitled to priority for federal funds in accordance with an approved state priority system and the state Priority List. This means that within the constraints of the congressional appropriation process and other constraints described below, the state controls the timing and amount of federal grants under the Clean Water Act's Construction Grants Program. The state decides how to rank potential Step 1, 2 or 3 projects (the priority system) and then publishes a list (the Priority List) of projects in the order in which federal grants will be made. Typically, the public gets involved in the Construction Grant Program after this priority ranking is decided and the award of a Step 1 grant is imminent or already made. However, if you are interested in the statewide program for water quality or are a local official or citizen concerned about the timing and amount of federal funding, here's how the priority system works:

There are a number of constraints on a state's use of its federal construction grant allotment. The priority system used by the state to determine its Priority List is reviewed and approved by EPA to ensure "procedural completeness" and to see that it is "designed to obtain compliance with the enforceable requirements of the Act . . ." [40 CFR 35.915(a)]

The priority system, or revisions of it, must also be subject to a public hearing. A summary of public comment must be included when a state submits its priority system to EPA. The priority system must include a system for public involvement in revisions to the system and in adoption of the Priority List.

Typically, a state sets up several categories as a way to classify its waste treatment needs. The Clean Water Act requires that categories be related to such things as the severity of the water pollution problem, the extent of the population affected by the pollution, the need to preserve high quality waters and the necessity to assure compliance with state water quality standards. Classifications based on economic criteria (such as the level of unemployment in an area) or criteria generally based on anything other than water quality are not acceptable. This requirement emphasizes that the Construction Grants Program is based on water pollution rather than its public works or job-producing aspects.

Once these general categories and subcategories are decided, each state can select its own system for weighting the various categories. If the state wants to give higher priority to achieving water quality standards than to other classifications (for example, preserving existing high quality waters), it is free to do so. Each state is required, however, to define its fundable projects in one list that groups them according to the following breakdown: Category I, secondary treatment; Category II, more stringent treatment necessary for compliance with state law; Category IIIA, infiltration/inflow corrections; Category IIIB, major rehabilitation or replacement of existing systems; Category IVA, new new collector sewers and appurtences; Category IVB, new interceptor sewers and appurtences; and Category V, correction of combined sewer overflows.

Whatever the system for ranking the eligible projects, it must be applied consistently. The only limit on the state's freedom to put a project on the Priority List is that the project must meet the enforceable goals of the Clean Water Act. (Special provisions regarding sewers are described below.)

There are a number of "reserves" or "set-asides" required by the 1977 Clean Water Act. These involve amounts or percentages of the state's total construction grants allotment that must be used for certain kinds of projects or for certain kinds of goals. Although EPA regulations are not explicit on this subject, these new requirements would seem to mandate a major revision to the state priority systems that have been in existence since 1973. Participating in the required hearing on any revision of your state's system is one way you will be able to influence which projects come first in the race for federal funds.

The final state Priority List must reflect a mix of high priority projects that are ready to proceed and which reflect the following reserves:

1) A state may give higher priority to those projects in the Step 2 and 3 phases that utilize innovative or alternative techniques and processes.

2) A state with a rural population of 25 percent or more must set aside 4 percent of its allotment for small rural communities and other less populated areas to be used for alternatives to conventional sewage treatment works. A governor of a "nonrural" state may request up to 4 percent of its allotment for the same purpose.

3) Treatment works that use innovative or alternative processes and techniques are allowed an increase in the federal share from 75 percent to 85 percent. A state must set aside 2 percent of its alloted funds for the extra incurment of these projects (3 percent in 1981). One-fourth of the allotment must be used only for the innovative projects.

4) A state may spend up to 25 percent of its allotment on so-called "pipe projects": rehabilitation of existing sewer systems; new collector services; new interceptors; correction of combined sewer overflows. Expenditures for pipe projects must meet constraints imposed by a number of regulations (such as cost-effectiveness requirements) and be otherwise eligible for a federal grant. EPA regulations state that when pipe projects exceed 25 percent of a state's construction grant allotment, allocation for these projects will be carefully examined to see that the proportion of pipe projects exceeding 25 percent meet the enforceable goals of the Act. Specific projects will be dropped from the Priority List if they fail to help meet enforceable goals, until the so-called pipe projects total no more than 25 percent of the allocation.

5) Up to 2 percent of the state allotment, or $400,000, whichever is greater, may be allocated to the state agency to reimburse it for construction grant management functions (CMAG, see Chapter III) it has undertaken pursuant to a Delegation Agreement.

6) Each Priority List must reserve 5 percent of its allotment for contingencies involved in increased grant needs.

7) A state may set aside up to 10 percent of its allotment for Step 1 or Step 2 projects that are of a lower priority than current funds would allow or for which no need had surfaced yet at the time of Priority List development.

The Priority List

Each state submits a five-year Priority List each year for EPA approval. A public hearing must be held before it is submitted. EPA's review consists only of assuring that the criteria adopted by the state have been applied consistently and that individual projects will result in compliance with enforceable requirements of the Act. If EPA challenges a project's place on the Priority List, a public hearing must be held. Revisions to the Priority List will also generally require a public hearing.

Theoretically, it should not be difficult to find ways and means to spend the available federal money on the basis of totally objective criteria. However, "federal grantsmanship" --the constant struggle among local officials for their share of federal dollars for whatever project--certainly enters into the system, if not overtly then in covert ways. The most common conflict is the "city problem." The largest city in the state often suffers the worst pollution problem simply because its discharge of untreated wastes affects a larger percentage of the state population. In a sparsely populated state, solving the big city's problem may use up the bulk of the state's allotment. How to concentrate on solving the worst pollution problems first, but still distribute federal funds equitably around the state, is often a headache for the state water quality agency director, who well knows that rural areas tend to dominate state legislatures from whom his budget and his legislative authority come.

In the past EPA discouraged the use of population alone as a deciding factor in the allocation of construction grant funds, but the 1977 Amendments to the Clean Water Act make clear that a state may give whatever weight it desires to population so long as it is related to water quality goals. Realistically, the use of an entire state allotment for Step 3 construction in a large city is unlikely; more likely the large city system would be built in segments so that construction--and cost--is spread over many years.

The most controversial part of the Priority List for people concerned about the growth-inducing aspects of the Construction Grants Program will be the percentage of the state's allotment devoted to pipe projects: collector sewers, interceptors, combined sewer overflows, etc. Find out how your state ranks the importance of these projects; the time to ask questions and demand explanations is at the mandatory annual public hearing on the submission of the Priority List to EPA.

The Grant Application

After a project is placed on the fundable portion of the approved Priority List (the portion for which funds will be alloted in the coming fiscal year) the public body responsible for sewer management must take the initial steps of applying for federal financial assistance.

As one such step, the community must formally designate a government official (not a consultant) to act for it in all matters relative to application for federal assistance. This designee may well continue in a key role through the three-step construction grants process; his/her attitude about public involvement and other matters of community interest will be important in shaping facilities planning policies and procedures once a grant has been procured. If possible, the public should advise on selection of this person.

The application and related documents will be reviewed first by the state water quality agency, then by EPA. No grant payment will be made for any Step 1 facility planning work that was begun prior to EPA's award of the grant, or without written approval of the Plan of Study accompanied by reservation from the state allotment of the needed funds.

What Are the Key Elements of the Grant Application?

- A Plan of Study should briefly describe problem areas, scope of the planning effort, and work schedule. Eventually, the Plan of Study will be made part of the grant agreement; the work schedule and cost estimates related to the proposed Step 1 work will be used to determine a formal grant payment schedule. Remember that the Plan of Study, and the Step 1 planning budget, can be important for what they leave out as well as what they include. If, for example, there is community interest in thoroughly pursuing on-site, innovative, or alternative wastewater treatment processes, it would be desirable to spell this out in the Plan of Study. The Plan of Study should also provide for public participation procedures to be implemented during facilities planning. Funds for special investigations and public participation should be specified in the planning budget.

- Comments from the appropriate "208 agency" (see Chapter II). Community leaders should discuss their application with this agency in advance to assure full consideration of any special aspects of the Plan of Study. The 208 plan is critically important to facilities planning (see later sections in Chapter V about on service area, facility sizing, and community options).

- A description of how a consulting engineer will be selected, and copies of proposed engineering contracts. The consulting engineer plays a critical role in facilities planning; in fact, selection of the engineer may be the most important decision made by the community in the whole planning process. Selection procedures are therefore of more than passing interest, and the consulting contract will help to define the scope and nature of the ultimate Facilities Plan. The contract should also describe the engineer's role in assisting public participation in the planning effort.

It should be noted that the Plan of Study and the costs of producing it are not eligible for reimbursement as part of the Step 1 planning effort. The time devoted to it and the level of detail it contains usually reflects this fact.

Plans of Study are often preceded or accompanied by a conference between applicant, the consultant and representatives of state and EPA agencies. These preapplicaton conferences review in detail what is required for an acceptable Facilities Plan so that all concerned understand the task ahead. Treatment alternatives to be explored in the Plan of Study are often discussed in some detail; controversial issues such as geographic scope may be reviewed and decided. Potential environmental issues may be raised, thus underlining the importance of the environmental assessment that is part of every Facilities Plan.

The Plan of Study is the focus for a series of major decisions, many of which surface for public review for the first time: the drawing of planning boundaries; minimum treatment requirements for the facility in question; selection and cost of the engineering consultant; preliminary selection of waste treatment alternatives to be examined during the planning phase; and the public participation plan for the planning phase. It is not unusual for a Plan of Study to be prepared by an engineering consultant who is likely to become the consultant for the entire Step 1 Plan.

The amount of the initial Step 1 grant award will be determined on the basis of the budget outlined in the Plan of Study. If the scope of work changes after the Plan of Study is completed, a formal "change order" (approved first by the state agency and then by EPA) must be filed before the applicant can receive more federal money. Approval of a change order will depend on how sympathetic the agency reviewer is to the goals of the change order and how closely budgeted the state's annual construction grant allocation is. (This is not to discourage you from submitting change orders when necessary; but it may be more effective to be sure an item is budgeted correctly to begin with than to submit a change order.) As mentioned earlier, 5 percent of the state's allocation must be set aside for increases to on-going projects.

What is the Role of the Consulting Engineer?

Many citizen leaders involved in facilities planning are shocked to discover that signifiant decisions are made long before the grant award. And many of these critical decisions are reflected in the selection of the principal local actors--the key local government representative and the consulting engineer.

A Step 1 grant may only be awarded to an applicant with the capability of constructing or managing the facility. When a waste treatment management agency has been designated in the Water Quality Management process, a grant may only be awarded to that designated agency.

It is theoretically possible for the public body that will "own" the new treatment facility to itself carry out the task of facilities planning through its sewage agencies. The record suggests, however, that the facility owners and operators are reluctant to accept direct responsibility for planning and construction--even if such agency has the capability to enlarge its staff to provide the required engineering talent.

In any event, the major day-to-day job of detailed facilities planning will in all likelihood be performed by a consulting engineering firm. Federal regulations require, among other things, that the engineer for any federally-assisted wastewater facility be selected on the basis of proposals submitted by at least three firms.

Choosing the engineering firm may well be the most significant single planning step the community will take, though it's not often recognized as such. The firm will likely stay with the project through all three steps of the process, ending up with final responsibility to oversee construction and initial operation of the facility. The community should therefore take care to advertise widely its need for an engineering consultant, review thoroughly and compare the engineers' proposals it receives, and evaluate as well as possible the facilities plans prepared by each firm for other communities.

Does the firm's proposal and track record indicate inclination and capability to consider a full range of solutions to the community's wastewater problems, or does the firm instead seem to specialize in some particular engineering approach? Does the firm support any specific philosophy about community development that might cause difficulties on down the road? Does the firm's demeanor fit the character of the community? Does the firm appear interested in and sympathetic to the public participation role the community expects of the engineer? Are its proposed financial and other contractual arrangements clear and fully understandable? The answers to questions such as these may have a bearing on the ultimate acceptability and success of the Facilities Plan.

The consulting engineering firm will report to someone in the community--probably the officially designated representative of the "applicant" (see Chapter III) or the staff head of the applicant agency. Except as provided in the consulting arrangements, the engineer's dealings with the community will tend to be channeled through this person or the applicant agency. Few, if any, engineers will "go around" their official contact point to deal directly with the community on sensitive planning policy issues. Thus, the person to whom the engineer reports is obligated to bring such issues into the open, and has special importance in the planning process; the community should select that person carefully.

What is the Role of the Public Participation Outline in the Plan of Study?

New EPA regulations to implement Section 101(e) of the Clean Water Act require communities to submit a public participation outline as part of every grant application. The workplan is to describe staff and budget resources for public participation; the proposed schedule of public partcipation according to decision points in the program; types of information and consultation mechanisms; and the segments of the public to be targeted for consultation. At a minimum, this workplan will establish the initial budget for public participation in facilities planning, and may, in fact, outline formal public involvement opportunities that will be utilized. If you're involved in the facilities planning process in your area, you will want to pay particular attention to the public participation element of the Plan of Study. (Chapter VI details the public participation regulations governing the Construction Grants Program, and suggests how to implement them.)

FOOTNOTES - CHAPTER IV

1. EPA Draft Policy Requirements Memorandum, "Grant Eligibility of Single Purpose and Multi-purpose Projects Using Innovative and Alternative Technology," January, 1979.

2. 40 CFR, Part 35, Subpart E, Appendix E, "Innovative and Alternative Technology Guidelines," (43 Fed. Reg. p. 44098, Sept. 27, 1978).

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FACILITIES PLANNING

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CHAPTER V

FACILITIES PLANNING

Size of the treatment plant, its sewered area, the type of treatment technology, and mitigating measures to soften environmental impacts: These are some of the facilities planning decisions to be made by a community once it has received a Step 1 construction grant.

What Topics Covered are in the Facilities Plan?

The content, scope, and degree of detail of a facilities plan will depend on the facilities being considered, the initial Plan of Study and the working budget. The preapplication conference and follow-up discussions between the applicant, state and EPA officials, and consulting engineer will determine the exact content of each plan.

In general, to pave the way for approval of a Step 2 grant application the Facilities Plan should include:

- An introduction, describing why a plan is needed and outlining its major objectives. Of particular importance is a review of effluent limitations (see Chapter IV); these controls, spelled out in NPDES permits, determine the level of treatment required since they establish the types and quantities of pollutants that can be discharged from the wastewater treatment facility.

- A description of the community's current situation, including water quality problems, environmental conditions, all wastewater sources, existing wastewater facilities, and pertinent institutional, demographic, and land-use data.

- An engineer's evaluation of the existing sewer system (if any) to determine (1) how much of the existing sewage treatment capacity is consumed by groundwater and stormwater leakage into sewers ("infiltration and inflow" or "I/I" analysis), and (2) what might be done to correct serious problems that have been identified ("Sewer System Evaluation Survey" or "SSES").

- Planning Criteria, including flow and wasteload assumptions, effluent limitations, and future needs--to be used as the basis for facility design. (See following sections on service areas, facility sizing, and controlling criteria and standards.)

This chapter was adapted from manuscript by Robert T. Dennis and Elizabeth Haskell.

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- Engineering alternatives for implementing the planning criteria and objectives (see "What are the Planing Options?" below). In most cases, each engineering alternative will include:

  1) A wastewater treatment facility--a "conventional" plant using physical, chemical, and biological treatment processes, for example, or a partial treatment facility to prepare wastewater for application to the land (see "The Basic Treatment Choices" below).

  2) Sewers. Included here might be new or rehabilitated interceptor (major trunk) or collector (neighborhood) sewers. To be eligible for grant assistance, however, collector sewers must meet strict criteria (see "The Sewer Issue" below). Sewer facility planning might also address the problem of controlling pollution from storm sewers: Treatment facilities for combined wastewater and storm sewers may be grant-eligible, but separate storm sewer facilities are not.

  3) Pump stations needed to move wastewater through sewers.

  4) Sludge and/or effluent management systems.

- Comparison of alternatives in terms of economics, environmental impacts, and implementation. This comparison will focus on determining the "best practicable waste treatment technology" (BPWTT) from among such alternatives as treatment and discharge, treatment and reuse, land application, revenue generating facilities, and on-site and nonconventional systems. (Best practicable waste treatement technology means the most cost-effective system that produces effluent of the required quality.)

The comparison must also document what opportunities the public has to participate in assessing alternatives; it should describe major points raised and opinions expressed by the public about the alternatives, and should indicate the planning response to those points and opinions.

As an interested citizen, you should keep in mind that the Clean Water Act includes a general requirement for public participation, and that EPA encourages public participation in facilities planning throughout the planning process and urges grantees to use a variety of techniques to assure that such participation takes place. EPA requires a public hearing on the Facilities Plan unless EPA has waived the requirement in advance. In any event, if you believe facilities planning is off course and not likely to be corrected locally, voice your concerns to EPA.

Comments of relevant state, interstate, regional and local agencies. These will range from the state health department to regional planning bodies.

Selection of the recommended alternative.

An environmental assessment of the recommended alternative. This critical element of the Facilities Plan is discussed more fully later in this chapter.

Statement on land treatment alternatives and innovative technology. Clean Water Act amendments approved by Congress in 1977 require that EPA withhold grants for construction unless the applicant has demonstrated that "innovative and alternative wastewater treatment processes and techniques which provide for the reclaiming and reuse of water, otherwise eliminate the discharge of pollutants, and utilize recycling techniques, land treatment, new or improved methods of waste treatment management . . . have been fully studied and evaluated . . . ." EPA regulations require that all facilities planning begun after September 30, 1978 (whether or not prepared under a Step 1 grant), evaluate these opportunities.

A municipal pretreatment program, where appropriate, to pretreat industrial discharges before they enter a municipal facility.

Statement on total energy requirements and energy conservation or recovery possibilities.

Statement on outdoor recreation and open space potential of the facility. Another 1977 amendment requires analysis of recreation and open space opportunities before a construction grant is approved.

Preliminary engineering design and cost estimates for the recommended alternative, including an estimate of costs that must be borne by the community and an indication of what these costs will mean to the individual user of the community wastewater system.

Implementation arrangements. The Facilities Plan must describe how the selected alternative will actually be constructed. Performance and cost schedules are to be outlined and local government and applicant responsibilities defined. The key item here is an approved plan for providing the nonfederal funds required for facility construction.

What Are the Major Decision Points in the Facilities Planning Process?

The fundamental decisions of facilities planning are made in the context of formal "steps" or decision points. Federal and state officials, local government grantees and consulting engineers generally refer to the following seven decision points when describing the facilities planning process:

- the Plan of Study/grant application
- assessment of the current situation
- assessment of the future situation
- identification of alternatives
- cost-effectiveness analysis
- environmental assessment/Environmental Impact Statement
- selection of recommended alternative

The facilities planning process is in fact much more complex than just seven linear steps: The 201 public participation planning guide found in Chapter VI breaks these steps down into 26 decision points, each one involving the resolution of a series of issues. And, of course, the public participation process and the environmental impact assessment process (described later in this chapter) are woven into all of the elements of Step 1 planning. On their surface, the facilities planning steps appear logical and linear; in fact, they bear a circular relationship to one another. Information gathered and decisions made must be constantly reevaluated as new information becomes available.

Table 3--a much simplified and shortened description of the major decisions you'll want to be involved in during the Step I process--is the framework for the discussions that follow.

What Are the Important Issues for Public Involvement in Assessing the Current Situation?

This first decision point is not just a straightforward data-gathering exercise: It is in fact a critical step for public involvement. Information not gathered, or misinterpreted may substantially affect the outcome of the facilities planning process.

The infiltration/inflow analysis (I/I), one of the first steps of facilities planning, is a preliminary engineering evaluation of the sewer system to find out how

TABLE 3

MAJOR FACILITIES PLANNING DECISIONS

DECISION POINT	ISSUES	QUESTIONS
Assess the Current Situation	a) gather information on planning area: institutions population environment water quality other environmental conditions b) gather data on: existing wastewater flows existing treatment systems infiltration/inflow analysis performance of existing systems	What are our water quality problems? Are the existing facilities adequate? What unique resources does our community have that are worth protecting?
Assess the Future Situation	a) land use b) demographic and economic projections c) future flow and wasteloads d) future environment without treatment project	How much growth is projected to occur? Are projections consistent with community goals/land-use plans? Are wastewater flow projections accurate? Is a new treatment facility necessary to preserve environmental quality of community?
Identify Alternatives	a) biological or physical/chemical treatment and discharge to receiving water b) reuse/recycling systems c) land application systems d) revenue generating applications e) on-site and nonconventional systems f) sludge and residual disposal alternatives	Is a full range of alternatives being considered including smaller scale, low technology options as well as centralized high technology ones? Is land treatment being seriously considered? Are there opportunities to recycle or reuse treated wastewater? How much treatment capacity is required?

TABLE 3 cont'd.

DECISION POINT	ISSUES	QUESTIONS
Cost Effectiveness Analysis	a) establish present worth of alternatives (monetary value of capital costs plus O&M costs over life of of project. 1) service area 2) service life 3) staging construction b) develop water conservation program c) institutional arrangements for implementation d) environmental impact assessment for each alternative e) recreational use assessment for each alternative f) energy consumption assessment	What sewage treatment alternative has the least monetary cost without overriding environmental and social considerations?
Environmental Impact Statement (EIS)	a) gather additional information on primary and secondary environmental impacts. b) prepare draft impact statement and seek public and governmental review of draft EIS.	Are the environmental impacts identified in the environmental assessment significant enough to warrant a full scale EIS?
Select Alternative	a) develop measures to mitigate primary and secondary environmental impacts b) select site	

much of the total wastewater flow comes from excessive infiltration into the sewer system from leaky pipes or excessive inflow from various kinds of storm drains. If excessive I/I is found, a more extensive study of the sewer system will be made to determine how much rehabilitation of pipes and drains can cost-effectively replace the need for extra treatment plant capacity.

The infiltration/inflow analysis results have both economic and environmental consequences. The economic issue: Is it cheaper (more cost-effective) to provide more treatment capacity to compensate for excessive infiltration/inflow, or to repair the sewer system?

The environmental consequences are more complex. Excessive infiltration/inflow usually happens during rainy periods. Excess plant capacity intended to accommodate peak foul weather periods can become instead an excuse for more sewer hook-ups, thus, an incentive to further community growth. More hook-ups mean less excess capacity, and can lead to plant overflows during rainy weather. The environmental issue: How do you control sewer hook-ups to keep this from happening?

During the "current situation" assessment you will also want to know the accuracy of data gathering. Have current water quality problems been sufficiently and accurately identified? For example, are the sources of current wastewater flows known? What portion of the community's water quality problem comes from nonpoint sources or industry? What is the current per capita daily wastewater flow? How well are the existing treatment facilities operated? Has existing population and land use data been properly assessed? Have all environmentally sensitive areas been identified?.

The answers to these and other questions will affect eventual decisions on how much treatment capacity is needed and whether industrial pretreatment programs are required. Environmental data-gathering also will define the outside parameters of the environemental impact assessment/statement process.

What Are the Important Issues for Public Involvement in Assessing the Future Situation?

How big should a new facility be?

Determining facility size is in part a technical job, based on average-to-peak flow ratios, land slopes, and the like. It is also subject to federal policies limiting grant payments for "reserve" (growth) capacity.

The facility should be large enough to last 20 years from its day of operation (Construction in stages at less than 20-year increments will be considered during the cost-effective analysis.)

There are three variables governing facility size that the community can influence: population projections, per capita wastewater flow calculations, and amount and type of industrial discharge into municipal facilities.

How is future population estimated?

Over the years, communities throughout the United States have turned bullish population forecasts into self-fulfilling prophesies by providing the sewage treatment and other infrastructure necessary to sustain growth; many Americans now question the quality of what has resulted. Other communities are paying for facilities designed to serve "phantom populations" that haven't yet materialized. Thus there is new interest in rational population forecasting.

To avoid paying for more waste treatment capacity than is actually needed nationwide, EPA requires that forecasts of population for each facilities planning area be consistent with national and state projections. The state water quality agency usually prepares local population projections for inclusion in individual Facilities Plans. These forecasts are to be submitted as part of the State Water Quality Management Plan.

The U.S. Department of Commerce's Bureau of Economic Analysis (BEA) has developed 1977 population projections for each state which generally are to be used as the basis for state and local forecasts. The state's own projections, if prepared before June 26, 1978, may be used so long as the forcast for the state for the year 2000 does not exceed the BEA projection by more than 5 percent. If it does, the state must either lower its projections or justify its higher figure. The EPA Regional Administrator must request public comment and may call a public hearing before granting a variance.

The state water quality agency, working with designated 208 planning agencies and other regional agencies, will break down the state population projection into area forecasts. The sum total of all the smaller area projections is not to exceed the statewide forecast. If a 208 planning agency has already developed a forecast for its area, it may be used so long as its estimated population for the year 2000 does not exceed the BEA breakdown by more than 10 percent.

For nonmetropolitan regions (not located in 208 areas), the state may set population projections; or, the grantee can forecast its own population based on simple linear extrapolation of growth trends from 1960 to the present, on telephone company or other business projections, or on other documented estimates. The state will review these grantee-developed forecasts for consistency with overall projections.

The state must submit its breakdowns of state population projections to the EPA Regional Administrator for approval by October 1, 1979. Before submitting them, however, the state must hold a public meeting. Once approved, the totals must be used for areawide water quality management planning as well as facilities planning and needs surveys. All Facilities Plans prepared under Step 1 grants awarded 6 months after EPA approval of state forecasts must adopt the appropriate state-approved forecast.

A community's population 20 years hence will equal its present population, plus births and in-migration over those years, minus deaths and out-migration.

Projections are essentially "short cut" techniques for making assumptions about the unknown parts of that equation.

For example, the U.S. Census Bureau keeps at least eight "series" of population projections, all using different assumptions about the national fertility rate (children per woman) (but none recognizing illegal immigration to the United States). BEA population projections are based on the Census Bureau's Series E projection, which assumes a fertility rate of 2.11. The national rate has actually been running at about 1.8 in recent years, but many demographers believe it is about to rise.

A community might have valid reasons to assume fertility rate different from Series E; or it might believe it was attracting large numbers of illegal aliens and wish to incorporate that fact in its projections. Once the state has completed its initial forecasts, it will obviously be difficult to change them. But if you want to lower (or raise) the population projection for your facilities planning area, remember that water quality management planning is a continuous process. Part of the process should be a formal set of procedures to amend decisions made previously.

How much wastewater will the population generate?

Basically, future need for sewage treatment capacity is determined by multiplying total population times wastewater volume per capita. (There are, however, other variables involved.) Recent studies suggest that sewage flows often fall into the range of 50-80 gallons per capita per day (gpcd).

Many facilities in the past have been designed to accommodate flows at inflated rates of 100-125 gpcd-- the difference being costly excess capacity in the wastewater system.

New EPA cost-effectiveness guidelines impose stronger controls on how wastewater flows may be estimated.

Where does industry fit into the facility sizing picture?

Most communities include industries, many of which do or potentially could discharge industrial wastes into the municipal sewer system. These wastes, depending on their composition, can make biological sewage treatment processes less effective, impair operation of physical/chemical systems, and introduce substances that can cause problems in sewers (fire, corrosion, explosion), sludges, and land treatment systems.

Treatment of these wastes almost invariably will require modification of treatment processes. However, joint treatment of community and industrial wastes may also produce benefits: economies of scale, reduced costs to domestic users and operational improvements. (Nutrients in domestic sewage may aid the biological treatment of industrial wastes, for example.)

Each community will have to decide what seems best in its case; it will particularly have to consider the impact new industry will have on existing treatment facilities and processes. Note, for example, that a single small new industrial user might introduce a compound into the treatment system that makes land application of sludge inadvisable--leaving the community with a brand new headache over what to do with the stuff.

What federal (and state) requirements apply to industrial users?

Since industrial wastes may "upset" or damage wastewater treatment plants, EPA has issued general standards for pretreatment of these wastes if they are introduced into publicly-owned treatment works. State or local government may adopt more stringent controls; but in any case, EPA will apply national "best available technology" treatment standards to a range of hazardous and toxic substances.

EPA will require each agency operating a federally-assisted facility (or its "parent" local government) to adopt and enforce a municipal ordinance governing industrial use of its plant. Under EPA guidance, it must establish limitations for specific pollutants contained in industrial discharges. Furthermore, as a condition to federal grants, the locality must adopt a program to manage its ordinance that includes regular monitoring and enforcement of national standards.

What about commercial and industrial wastewater flow?

In addition to industrial plants, wastewater loads must be estimated for all existing and planned business establishments, churches, schools, and similar facilities. Controlling factors here will be the community's policies and plans governing new commercial and industrial growth, and actions taken to reduce industrial waste flows.

Industrial flows, according to EPA regulations, must be calculated by adding together flows from industries that now use existing treatment works, after considering ways to reduce such flows. Letters of intent are required to document anticipated future industrial users, as specified in EPA's industrial cost recovery guidelines. Unforeseen industrial growth is allowed to a maximum of 5 percent of total design flow--10 percent for towns with populations less than 10,000--or 25 percent of the total industrial flow, whichever is greater.

How is the total wastewater flow estimate calculated?

For the design of treatment works, total average annual flows are projected based on expected future population, per capita use, impacts of water conservation, current industrial activity and the allowance for unanticipated industrial growth. It is also necessary to calculate the Average Daily Base Flow (ADBF)--the flow expected daily from residences, nonresidential sources, commercial sources, institutional sources, industries to be served by the works (plus allowances for future industries), and reasonable infiltration/inflows.

EPA guidelines specify two methods for projecting the ADBF from combined residential, commercial and institutional sources. The preferred method is to rely on water use records, multiplying per-capita flows for the existing sewered population times the projected populations. Seasonal visitors to a community, for example, for employment or recreational purposes are converted to full time resident equivalents by using the following multipliers:

day-use (short term) visitor	(0.1 - 0.2)
seasonal visitor	(0.5 - 0.8)

No allowance is permitted for future increases in per-capita flow. It is assumed that flow reduction measures will be introduced.

If no water supply and wastewater flow data are available, the ADBF can be estimated by a second method, multiplying a gallon per-capita-per-day (gpcd) allowance (not exceeding those in the following table) by the estimated total populations to be served. The tabulated gpcd allowances, based on several studies of municipal water use, include estimates for commercial, institutional and residential sources.

	GPCD
• Non-SMSA* cities and towns with projected total 10-year populations of 5,000 or less	60-70
• Other cities and towns	65-80

The EPA Regional Administrator may approve exceptions to these allowances where more than 25 percent of the flow comes from commercial and industrial sources.

Is it better to seek reduced flows or to build "reserve" (growth) capacity?

EPA will require the community to make a cost-effectiveness study to find out which is cheaper: undertaking water conservation measures or building extra capacity into the wastewater treatment facilities.

In this cost-effectiveness analysis, every facility plan is required to study, at a minimum:

1) Flow reduction from existing residential, commercial and institutional sources, based on retrofit of water meters, toilet dams and low-flow showerheads. Such reductions must be subtracted from the ADBF (unless the ADBF from the area is less than 70 gpcd, the current population of the applicant is under 10,000,000 or the area is exempted by the EPA Regional Administrator because it already has an effective existing flow reduction program).

2) Flow reduction 10 to 20 years hence achieved through changes in local ordinances, building codes or plumbing codes to require water conservation devices and practices, and from public information programs.

The costs, cost-savings and effects of public education measures, pricing policies and regulatory approaches to water conservation are to be calculated for the 20-year planning period.

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* Standard Metropolitan Statistical Area.

The net cost of proposed flow reduction programs are to be compared with the net financial and energy savings. The Facilities Plan must include a description of how and when these programs will take effect, as well as assignments of responsibility for management and enforcement to governmental jurisdictions.

It should be noted that while EPA is fairly conservative in its interpretation of an acceptable ADBF, it does not require a strong flow reduction program to ensure that per capita consumption assumptions are never exceeded; it only requires that a public information program be developed to emphasize the benefits of flow reduction. Nor does EPA provide funds to institute a water conservation program. The adoption adoption of many other flow reduction measures (even cost-effective ones will occur only if they have public support and the sewer grantee has the authority to implement them (or the cooperation of another governmental entity that has authority). When the grantee is an independent sewer authority without other community management responsibilities, this implementation link may be difficult to make.

Cost-effective flow reduction programs will save the community both money and resources: Reduced per capita water consumption means reduced need for treatment capacity, which in turns means lower capital and operational costs.

But active public involvement at the local level will be needed to drum up public and political support for the program that brings those savings.

What about future land uses?

Your community's assessment of its future land uses will partly determine capacity, location and service areas of the recommended treatment plant. Local and regional land use and development plans provide a framework for facilities planning, as does the 208 planning process (described in Chapter II). Facilities Plans also must conform to the Water Quality Management Plans developed under Section 208. As discussed in Chapter I, after October 1, 1979, certain critical decisions generally must have been made through approved Water Quality Management Plans.

Yet the water quality management process is not static. Water Quality Management Plans must be reevaluated each year through a formal continuing planning process. Citizens should have ample opportunity to obtain amendment of a WQM plan where desirable.

As a concerned citizen, you will want to use the facilities planning process as a chance to review land-use planning decisions, some made as long as 20 years ago, that fail to consider environmental issues. Too often the 208 planning process has simply ratified rather than reevaluated existing land use plans. Before allowing those land-use decisions to be literally set in concrete, you should carefully review the assumptions concerning future land uses that become part of the Step I process.

The sewer issue

Chapters II and VII deal with the impacts of sewer construction. In brief, new sewers may stimulate new development and generate new wastewater loads.

As was discussed in Chapter II, there are basically three types of sewers associated with transporting sewage to a central treatment facility: interceptor sewers; collector sewers; and lateral sewers. Interceptor sewers are the essential large collector of sewage that gather waste from a number of neighborhoods and communities. The location and capacity of an interceptor sewer will frequently determine where new neighborhoods will be built. The EPA Construction Grants Program will help to pay for sewers that are a part of an approved, cost-effective treatment system.

Collector sewers are those that collect sewage from within a neighborhood itself. Collector sewers to new commuities generally are not fundable under the Construction Grants Program. You should be aware, however, that collector sewers may be fundable through other federal programs. Lateral sewers, the hook-ups from homes to the collector sewer, are not eligible for construction grant funding under any circumstances.

Even when sewers are not a cause of growth in a community, they certainly influence the location of growth. Equally important, when the size and quality of sewers are out of sync with the capacity of the treatment system, inadequate controls on hook-ups to the sewers may lead to overloaded treatment works.

The costs of a sewer system arise mostly from acquiring rights-of-way, laying pipes, and building pumping stations. It costs little more to install a large diameter sewer than a small one; there is thus strong temptation to build reserve or growth capacity into the system.

In 1972 and 1977 amendments to the Clean Water Act, Congress decided that construction grant money could be used to pay part of the cost of local growth. The sizing issues discussed earlier determine the cost-effective reserve capacity of a federally funded waste treatment facility.

As mentioned above, interceptor sewers may be funded by EPA, and under certain limited conditions, so may collector sewers. EPA has the authority, however, to strictly regulate the use of such grant funds.

Collection systems will only be funded, according to EPA regulations, when they are used to replace or rehabilitate an existing system or are needed for a new system in a community that existed before October 18, 1972 and has sufficient treatment capacity. The collection system also must conform with 208 plans, environmental laws and executive orders, and may not provide capacity for new homes or environmentally sensitive lands such as wetlands, floodplains or prime agricultural lands. "Appropriate and effective grant conditions, (e.g. restricting sewer hook-up) should be used where necessary to protect these resources from new development." [40 CFR 35.925-15]

Neither interceptor nor collector sewers may be constructed with federal funds if they are destined to serve primarily industrial users.

What controls will EPA exercise regarding the location of interceptor sewers?

Recognizing that hook-ups to oversized interceptor sewers that connect large tracts of vacant land to regional treatment facilities are a major cause of unplanned growth, EPA regulations require that interceptor sewer routes be planned and staged carefully. Unless the sewers are demonstrably necessary to alleviate existing problems, the cost-effectiveness guidelines state, they "should not be extended into environmentally sensitive areas, prime agricultural lands and other undeveloped areas (density less than one household per acre)." Whenever it is decided that an interceptor through such areas is the most cost-effective alternative to connect several communities, EPA requires the grantee to reassess carefully the need and reevaluate and mitigate the interceptor's primary and secondary environmental impacts. As with collector sewers "appropriate and effective grant conditions (e.g. restricting sewer hook-ups) should be used where necessary to protect environmentally sensitive areas or prime agricultural lands from new development." [40 CFR 35 Appendix A, 8]. Mitigating measures to protect environmentally sensitive areas and prime agricultural land from new development are to be included in the NPDES permit so that they can be easily implemented.

In the past most interceptor sewers were planned for a 50-year-plus service period. New EPA regulations call for federal financial assistance for a 20-year period unless the grantee demonstrates that a planning period not exceeding 40 years is consistent with approved water quality and other land use plans and will reduce overall environmental impacts.

If EPA refuses to fund certain kinds of sewers, can they still be built?

EPA regulations cover that part of a treatment system that will be built with construction grant funds. A community may decide, however, to build certain sewers and additional treatment capapcity with its own money. In this situation EPA will still pay for the part of treatment works which it determines represents the most cost-effective sollution to the water quality problem. Any additional costs must be covered by the community. (see "What costs are eligible for federal financial assistance through the Construction Grants Program?")

There are other federal grant and loan programs that may pick up some of the cost of a collection system not otherwise fundable through EPA. The Farmers Home Administration, HUD's Community Development Funds and the Economic Development Administration of the Department of Commerce all have water and sewer grant and/or loan programs. Adminstered under different criteria, these programs may provide financial assistance where EPA cannot.

What geographic areas will the facility serve?

Final decisions concerning the service area of a sewage treatment facility (or facilities) are effected enormously by the cost-effectiveness analyses conducted on the alternatives selected for in-depth study. Each alternative may not only involve different technologies, but also different service areas, or a number of different service areas.

This basic question of geographic area must be answered by the community itself, with advice from the engineer and the water quality specialist. The answer is often arrived at with difficulty--engineers might prefer a topographic service area where wastewater can flow by gravity to a central point; water quality planners have preferred the management control of large regional plants, at least in recent years; and the Federal Water Pollution Control Act also has been biased toward regional solutions. Local politicians and government officials generally recognize land within their political jurisdiction as the service area. Selecting the service area is by and large a political process.

A decade ago, the small neighborhood sewage treatment plant was generally regarded as a root cause of the American water pollution problem--poorly designed, cheaply constructed, improperly maintained, run by the mayor's brother-in-law and a couple of high school dropouts. So there was a strong trend away from small systems into larger centralized facilities served by major trunk sewers; these could be professionally staffed and economically operated. Of course, centralized facilities dumped a lot of effluent at one particular point--a problem sometimes overcome by applying space-age technology and large quantities of energy (advanced waste treatment). Then planners discovered that those extensive trunk sewer systems generated rapid suburban sprawl, sometimes in areas where no one really wanted it--and inflation, scarcity of materials and the energy crisis combined to render advanced waste treatment expensive. All of which suggests that there is no one best answer to the service area question.

In simplest terms, the service are question is this: Do you link a number of wastewater service areas together into a single large service area with a set of sewers, feeding a single central treatment facility (a system which will likely support additional population and industrial growth), or do you establish a number of smaller service areas which are interconnected to a lesser degree or not at all? The answer will determine much about the future size and shape of the community.

Small-scale service area options

The smallest scale wastewater facility service area is the individual septic system, compost toilet or similar innovative system. In 1977 the Clean Water Act recognized these individual systems as a valid option under the Construction Grants Program. But it is a limited option, and is clearly explained in the legislative language: "A grant may be made . . . to construct a privately-owned treatment works serving one or more principal residences or small commercial establishments constructed prior to, and inhabited on (December 27, 1977) when (EPA) finds that 1) a public body . . . eligible for a grant . . . has applied on behalf of a number of such units and certified that public ownership of such works is not feasible; 2) such public body has entered into an agreement with (EPA) which guarantees that such treatment works will be properly operated and maintained and . . . includes a system of charges to assure that each recipient of waste treatment services under such a grant will pay its proportionate share of the cost of operation and maintenance (including replacement) and; 3) the total cost and environmental impact of providing waste treatment services to such residences or commercial establishments will be less than the cost of providing a system of collection and central treatment of such wastes."

Since cost-effectiveness is a controlling federal criterion for service area and treatment mode decisionmaking, a community might well be forced to select centralized treatment even if it would prefer individual systems. (Of course, the community could always choose to forego federal grant funds, or to add additional local money to the 75 percent federal share of what would have been the most cost-effective solution, and require the private construction of individual systems of quality sufficient to meet federal and state standards--but the political and economic implications of that route loom large indeed.)

If individual systems aren't a viable option, then attention must shift to some sort of centralized facility served by sewers. Should the community's identified water problems be limited to a few scattered neighborhoods, the community might seek to locate small "package plant" facilities in each neighborhood, not interconnected by development-stimulating trunk sewers.

"Package plants"--essentially delivered by the manufacturer in ready-to-plug-in-and-operate condition--can deliver high quality treatment. But either a trained operator should be present at all times, or the plants should be monitored and supervised under a system that assures quick response to any malfunction. In past years, many a package plant has become just one more community headache.

Some rural communities have favored low-technology central treatment facilities, such as stabilization ponds or land application systems, which serve small areas and restrict growth. The 1977 amendments to the Clean Water Act set aside 4 percent of the construction grant allotment to states with a rural population of 25 percent or greater "only for alternatives to conventional sewage treatment works for municipalities having a population of 3,500 or less, or for the highly dispersed sections of larger municipalities." In other words, as in the case of individual systems, Congress recognizes that some communities will prefer to think small.

The regional service area

Large metropolitan wastewater treatment facilities have long been in vogue for economic reasons--more treatment capability can be provided per dollar, in terms of capital outlay, operation and maintenance. Since 1965, water quality policymakers have favored regional systems for other reasons, too: more professional operation, higher standards of treatment, fewer effluent discharge points which can be sited to incur minimal environmental damage.

A community that selects a regional service area for its new facilities probably will derive three major practical benefits. First, the Clean Water Act gives high priority to regional water quality planning, meaning that both the state water quality agency and EPA are likely to look kindly upon a regional facilities plan. Second, a project designed to solve water quality problems of regional scope will probably draw a higher priority rating from the state than smaller projects. Third, depending on what service area alternatives are studied, a regional plan may be most likely to meet federal cost-effectiveness criteria.

A central question is: How big a region? Enough serious disadvantages to large regional facilities have become apparent that regional solutions may have less appeal in the years ahead. By their nature, they tend to rely heavily on technology. Costs of building high technology-based plants are escalating rapidly, and may reach exorbitant levels when "advanced waste treatment" (extremely high levels of pollutant removal) is required to meet effluent standards. And, for a variety of reasons, the time lapse between planning and actual operation of large regional facilities ("construction time") may cause difficulties for the communities being served.

Furthermore, regional treatment plants collect the wastewater they treat through a network of interceptor or major trunk sewers; development generally follows those sewers, particularly where they cross open land, sometimes bringing unwanted patterns of suburban sprawl.

Finally, regional facilities usually serve more than one political jurisdiction, and therefore require interjurisdictional agreements and flow allocations that can be difficult to negotiate and achieve. Perhaps such problems can be most readily addressed by determining what entity is going to be responsible for constructing and operating the regional facilities--and, of course, controlling them. Will the facilities, for example, be provided by a central city? And if so, to what extent will that mean that the central city can control land use and industrial development decisions in suburban jurisdictions being served by the facilities?

Or should all the jurisdictions being served get together and create a new institutional entity to construct and operate the facilities? If so, what powers will the new entity have--how will it respond to the individual wishes of each jurisdiction? Such questions are not always answered easily, particularly when the jurisdictions to be served have conflicting philosophies about growth and public finance.

What Range of Alternatives Might Be Evaluated during the Facilities Planning Process?

Given all the criteria, standards, and policies that a community must deal with--secondary treatment, effluent controls, water quality standards, cost-effectiveness policy--the community may find that its range of facility options is severely limited. Indeed, those options may depend on the community's influence on facility service area and facility sizing. As the number of variables is reduced, the selection of treatment process may become more and more an engineering and economic decision.

Technical possibilities for wastewater treatment are numerous and may be combined in a variety of ways depending on the imagination of the designing engineer. Advantages and disadvantages of each must be determined in large part for each community on the basis of population, population distribution, land values, geology, climate, and similar factors. With no attempt to discuss the full range (or combinations) of options, some of the most basic alternatives are described below:

1. The Option of No Facility: Are New Facilities Required?

The first step in facilities planning is to determine whether new wastewater treatment facilities are in fact required--or if existing facilities can somehow be made to make do. Some communities will not need new facilties; identified problems might be corrected by repairs or improvements in the existing system or by modifying the treatment process now in use. Whether new facilities are needed will be decided, by-and-large, by addressing four subsidiary questions:

What water quality and/or related problems have been identified?

The water quality problem could have been discovered by a laboratory analysis of community lakes, streams, or groundwater--with such findings as high concentrations of fecal coliform bacteria, a toxic substance or other industrial waste, nutrient enrichment, or a deficiency in dissolved oxygen. Or maybe the effluent discharged from an existing facility does not meet EPA's national minimum standards for secondary treatment in terms of biochemical oxygen demand, suspended solids, and pH, or some other standard incorporated in its NPDES permit.

Air pollution from a sludge incinerator may be a problem, or change in sludge chemistry attributable to the new industrial plant that just moved into the community. Perhaps the local government wants to free itself from a court-ordered moratorium on new sewer hook-ups because the existing sewage treatment plant is operating at capacity (and not yet causing any water quality problems).

Can performance of existing facilities be improved?

Perhaps the existing sewage treatment plant can meet federal and state requirements by spending more money on operation and maintenance, thereby improving overall performance and reducing interruption of service. Maybe existing personnel are poorly trained or too few in number. Perhaps adding new chemicals to the existing process will make it more efficient. Or, if the community's problem is attributable to faulty private septic systems, perhaps a municipal ordinance setting maintenance requirements will do the trick.

Where sewers already exist, EPA requires a special sewer system evaluation ("infiltration and inflow" analysis) as part of each Facilities Plan. If sewer joints are faulty, pipes cracked, or manholes improperly constructed, groundwater and rainwater can get into the sewer system in such volume as to overload the sewage treatment plant and/or render treatment ineffective. Should this be the case, rehabilitation of the sewer system may solve--or help to solve--the water quality problem.

Flow equalization is not a treatment process per se, but a structural technique to improve the effectiveness of secondary and tertiary treatment plants and reduce the cost and size of any new plants. Large holding basins are built to catch wastewater flows and deliver them to the treatment plant in a steady flow, thereby improving the performance of the plant. Without such controls the flows and strength of the wastewater vary during the day, beginning to increase substantially about 10 a.m. and then decreasing again rapidly about 10 p.m.

Can industrial users of the system reduce their load?

Over the last decade, industrial pollution of America's waters has been reduced substantially in many cases by a change in industrial processes--different chemicals used, materials and by-product recovery, water conservation, closed systems, and other techniques. Industries discharging effluent through publicly owned treatment facilities may be able to assist in solving a community's water quality problem by incorporating a process change to alter the nature and volume of their effluent. The Clean Water Act offers financial incentives--through reductions in "Industrial Cost Recovery Payments"--to industries that conserve water and reduce total sewage flows.

Industrial wastewater may also be "pretreated" (at the industry's expense) before delivery to the community.

Can water conservation programs reduce or eliminate the need for new capacity?

Water conservation can reduce the amount of water used and then discharged into the treatment system. Public education, pricing policies and regulation, all of which must be considered in the cost-effectiveness analysis of any new construction, may in some cases obviate the need for such new construction. Water conservation is discussed in more detail earlier in this chapter.

2. "Traditional" Wastewater Treatment Options

This term, not generally used by water quality specialists, refers to a system that:

- delivers wastewater to a central wastewater treatment facility (which may be simply a stabilization pond system);
- subjects the wastewater to a series of physical, biological and chemical processes (which in the case of advanced waste treatment may produce a very high degree of pollutant removal); and then;
- discharges effluent to a stream, river, or other body of receiving water.

Depending upon the technology used and money spent, such treatment may deliver effluent of extremely high quality --even up to drinking water standards. It removes heavy metals and other toxic chemicals from wastewater (leaving them in sludge) and rapidly returns water to the surface hydrologic system, making it available for downstream use. And since it can be carried out on relatively small sites--from a few acres (rarely) to a couple of hundred at most--traditional treatment can be fitted into virtually any community.

Traditional treatment commonly relies heavily on technological approaches and can therefore be quite expensive, particularly when high levels of pollutant removal are required. It may "waste" effluent, particularly when well-treated effluent is discharged into waters polluted by other sources. It can create serious problems of sludge management (see below) and may be inefficient in putting nutrients and other valuable treatment "by-products" to beneficial use.

If a pollution problem has resulted from inadequate treatment by a facility, in most cases modifications can be made to provide higher levels of treatment, such as adding secondary treatment to a primary system or adding phosphorus or nitrogen removal to a conventional secondary plant.

If a community has no centralized collection and treatment system, or if upgrading its existing treatment facility will not achieve the desired pollution reduction or has other major nonmonetary costs, another alternative is to build a new centralized treatment facility.

In evaluating whether and how to expand and upgrade an existing facility or build a new one, communities should take into account the future possibility of adding wastewater reclamation facilities and modular increments for water reuse.

If a central treatment and disposal alternative is selected, communities will have to choose the size of the treatment plant, ranging from a small "package plant" to a large regional facility; the service area; staged development of the system, and the treatment technology.

Traditional, centralized treatment systems are of three general types: primary, secondary and advanced wastewater treatment. Primary treatment removes those pollutants that either settle or float--usually about 60 percent of the raw sewage and suspended solids and 35 percent of the biological oxygen demand (BOD) (see Glossary). Soluble pollutants are not removed. Federal law requires municipalities to provide at least secondary treatment unless a waiver has been granted for a deep water ocean discharge.

Secondary treatment removes more than 85 percent of the BOD and suspended solids by stimulating the natural decomposition of the waste matter, but it does not remove significant amounts of nitrogen, phosphorus, chemical oxygen demand (COD), or heavy metals, nor all pathogenic bacteria and viruses.

Thus, advanced waste treatment (AWT) may be needed--chemical treatment, filtration and disinfection.

Tables 4 and 5 summarize the available secondary and advanced waste treatment alternatives. Table 6 relates the available alternatives to requirements for pollutant removal. For further information on the various centralized treatment processes, see EPA's "Alternative Waste Management Techniques for Best Practicable Waste Treatment," October, 1975 (MCD-13).

3. Centralized Physical/Biological Chemical Treatment and Land Application of the Effluent

In this alternative, wastewater is processed as in traditional treatment, to a primary or secondary level, but the effluent is applied to the land, not discharged to a waterway. Federal law requires consideration of land application as a sewage treatment alternative. This method may provide an alternative to secondary treatment or to constructing an advanced wastewater treatment system. (In some cases, state public health laws require secondary treatment before land application. The necessity for this prior level of treatment is a subject of much controversy.)

TABLE 4: SECONDARY TREATMENT

Adapted from EPA Technology Transfer, Environmetal Pollution Control Alternatives: Municipal Wastewater

Treatment Process	Advantages	Disadvantages	Space Requirements	Costs*		Effluent Quality
				per gal	per family**	
Trickling Filter rock media synthetic	Basic simplicity, Handles wide range of sewage flows, Relatively easy to operate and maintain, Low energy requirements (150 kwh/mg)	Affected markedly by temps, Less efficient in removing BOD and SS	1 acre/MGD	40-50¢/1000 gals (1 MGD) 15-20¢/1000 gals (10 MGD)	$4.20-5.25/mo $1.60-2.10/mo	Removes up to 85% of the BOD and 80% of the suspended solids (SS)
Activated Sludge	Versatility - handles wide variety of wastewater compositions, High efficiency in BOD removal, Lower capital costs than TF, Lower space requirements	Requires careful operation, High energy requirements (625 kwh/mg)	0.5 acres/MGD	45-55¢/1000 gals (1 MGD) 20-25¢/1000 gals (10 MGD)	$4.75-5.80/mo $2.10-2.60/mo	
Oxidation Ponds	Easy to construct, operate and maintain, Inexpensive to construct and maintain, Effective in removing pathogens	Large space requirements, Requires periodic removal of algae (can be expensive)	35 acres/MGD 85 acres/MGD	$2000/acre (larger than 25 acres) $6000-8000 (less than 5 acres) (excludes land costs) O+M costs = 25% of TF or AS process Costs of algae removal can range as high as 10% per 1000 gals		
Biodisc	No sludge or effluent recycle streams, Low maintenance, Relatively high degree of treatment, Requires fewer process decisions by operator	Must be covered from elements, Little long term operating experience in U.S., Moderate energy requirements (400 kwh/mg)	0.5 acres/MGD	Somewhat lower than activated-sludge		
Activated Biofilters	Combination of fixed microbial growth and high concentration of suspended growths provides stable operation and minimizes process upset, Can be added to existing activated sludge plant, Requires less area than TF plant, Less sensitive to cold temp effects	Supplemental aeration process often needed to meet secondary standards, Little operating experience in U.S., Relatively high energy requirements (500 kwh/mg)	0.5 acres/MGD			

* Average annual costs based on 1975 prices (capital and operating costs amortized over 20 years at 7% interest rate).

** Based on estimate of 350 gals/day for the average residence.

TABLE 5 : ADVANCED TREATMENT

Adapted from EPA Technology Transfer, Environmental Pollution Control Alternatives: Municipal Wastewater

Treatment Process	Advantages	Disadvantages	Space Requirements	Costs (1975 Dollars)		Effluent Quality
				per gal	per family	
Phosphorus - coagulation - sedimentation - land treatment	Well proven, reliable removal of BOD and SS, simple process control, Substantial removals of heavy metals, bacteria, viruses	General larger quantities of chemical sludge, May result in addition of dissolved solids to wastewater				Removes up to 95% BOD and 99% SS
Filtration	Provides means for controlling suspended solids content of secondary effluent, Well proven, readily automated, requires little operator attention, and little space	Generates a backwash waste stream which must recycled to plant		15¢/1000 gals (1 MGD) 6.5¢/1000 gals (10 MGD)	$1.60/mo $0.70/mo	
COD Removal - carbon absorption - land treatment	Removes organic materials that cannot be removed by biological secondary treatment, Can tolerate wide variations in flow or wastewater quality, requires little operator attention; requires little space	Expensive unless carbon is regenerated and recycled, Regeneration equipment is not readily adaptable to small plants (less than 3 MGD) Regeneration process requires careful operator control, Energy requirements high 500 kwh/mg	300-500 sq ft/MGD	35¢/1000 gals (1 MGD) 11¢/1000 gals (10 MGD)	$3.70/mo $1.15/mo	
Nitrogen Control - biological nitrification	Generates no significant added sludge, No objectionable side effects	Requires more space, Can be upset by toxic materials, Energy - 925 kwh/mg	0.3-0.6 acre/ MGD	30¢/1000 gals (1 MGD) 16¢/1000 gals (10 MGD)	$3.15/mo $1.70/mo	
- ammonia stripping	Lowest cost method, simplest to operate, reliable, small space needs	Affected by cold weather, Need to remove lime deposits in towers, Energy - 1000 kwh/mg	700 sq ft/MGD	9¢/1000 gals (1 MGD) 6¢/1000 gals (10 MGD)	$0.95/mo $0.65/mo	
- ion exchange	High efficiency, readily controlled, Not affected by temps, nitrogen can be recovered for fertilizer	Complicated equipment, high capital costs, Energy - 100 kwh/mg	1000 sq ft/MGD	20¢/1000 gals (1 MGD) 12¢/1000 gals (10 MGD)	$2.10/mo $1.25/mo	
- breakpoint chlorination	High efficiency, low space requirement, low capital costs, disinfectant capacity, minimizes disposal problems	Increases chloride content in wastewater, Requires large quantities of chloride	500 sq ft/MGD	11-15¢/1000 gals (no economy of scale)	$1.15-1.60/mo	
Land Treatment (may also be utilized as secondary treatment)	Provides advanced degree of treatment without generating any chemical sludges, Recycles water and nutrients for productive uses, No use of chemicals, Preservation of large open spaces, Low operating expenses with potential economic returns from sale of crops	Requires large land area, Still relatively new process; little data available on proper design of process for particular circumstances Energy requirements vary 1000-2500 kwh/mg	100-600 acres/ MGD	$0.20-1.09/ 1000/gals (1 MGD) $0.14-1.00/ 1000 gals (10 MGD)	$2.10-11.50/mo $1.50-10.50/mo	

(Costs of transporting wastes to treatment site not included.)

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Table 6

- BOD AND SUSPENDED SOLIDS
  - Trickling Filter
    - Rock Media
    - Synthetic media
  - Activated sludge
    - Conventional
    - Tapered aeration
    - Step aeration
    - Complete mix
    - Contact stabilization
    - Extended aeration
    - Oxidation ditch
    - Pure oxygen
  - Oxidation ponds and aerated lagoons
  - Rotating biological contactors
  - Activated biofilters
  - Physical-chemical treatment
- DISINFECTION
  - Chlorination
  - Ozonation
- PHOSPHORUS REMOVAL
  - Coagulation-sedimentation
    - Primary process
    - Secondary process
    - Tertiary process
    - Biological-chemical
  - Land treatment
- TERTIARY SUSPENDED SOLIDS REMOVAL AND BOD REMOVAL
  - Coagulation-sedimentation
  - Filtration
  - Microscreening
  - Land treatment
- COD REMOVAL
  - Activated carbon
    - Granular
    - Powdered
  - Land treatment
- NITROGEN REMOVAL
  - Biological nitrification-denitrification
  - Ammonia stripping
  - Ion exchange
  - Breakpoint chlorination
  - Land treatment
- ORGANIC SLUDGE HANDLING
  - Digestion
    - Land application (fertilizer)
    - Dewater
      - Bury
      - Land application (fertilizer)
      - Dry ------fertilizer
  - Dewater ——burn
  - Wet air oxidation
- AWT CHEMICAL SLUDGES
  - Recovery and reuse
  - Disposal

Summary of available alternatives relative to requirements for pollutant removal.

Source: "Environmental Pollution Control Alternatives: Municipal Wastewater," EPA, May, 1976

One method of land application, spray irrigation systems, removes pollutants by a soil-crop system, leaving the nutrients as fertilizer and effluent as moisture for the crops. Treatment is provided by natural processes as the effluent moves through the soil. Application rates will vary with the types of soil, climate, crops, and quality standards were runoff occurs. Secondary treatment and subsequent use of effluent for surface irrigation results in pollutant removals equivalent or superior to those produced by other advanced water treatment processes: BOD, 98 percent; COD, 80 percent; suspended solids, 98 percent; nitrogen, 85 percent; phosphorus, 98 percent; metals, 95 percent; and microorganisms, 98 percent. About 600 communities in the United States reuse municipal wastewater treatment effluent in surface irrigation systems, mostly in arid and semiarid regions.

Applied effluents are considered valuable resources. For example, in Lubbock, Texas, where irrigation water is scarce, 15 million gallons per day of secondary effluent is applied to 2,300 acres of wheat, barley, oats, rye, cotton and grain sorghum. Crop yields exceed those achieved with conventional irrigation.

In Muskegon, Michigan, 6,300 acres planted mostly with corn are irrigated by the secondary effluent from a $42 million, 43.3 mgd project. Crop yields were as high as 92 bushels per acre in 1974 and produced an income of $368,000. Water collected from underdrains beneath the the irrigated area is of extremely high quality.

A second land disposal method, called infiltration-percolation, achieves nearly complete infiltration of the applied water into the soil, thus, allowing greater application rates. All runoffs are controlled and groundwater recharged. Ideally, the application area for this method should be nearly flat, with a water-tolerant species of grass maintained and harvested as necessary. Typical removal of pollutants from secondary effluent are BOD, 85-99 percent; suspended solids, 98 percent; nitrogen, 0-50 percent; phosphorun, 60-95 percent; and metals 50-95 percent.

In a third method of land treatment, called overland flow, wastewater is sprayed over the upper edges of sloping terrain and flows slowly downhill through the grass and other vegetation. The vegetation, not the soil, is the primary filter. According to EPA research, typical removals are BOD, 92 percent; suspended solids, 92 percent; nitrogen 70-90 percent; phosphorus, 40-80 percent; and metals, 50 percent. Clay soils and moderate slopes are best suited to this technique. As the effluent flows down the slope, some if it infiltrates the soil, a small amount evaporates and the remainder (as much as 50 percent of the flow) goes to collection channels before discharge. The grass filters out the suspended solids, and the organics are oxidized by the bacteria living in the vegetation. In the United States this method has been used primarily for treating high-strength wastewater, such as that from canneries; it is used for municipal waste treatment in Australia.

4. Waste Treatment and Reuse of Purified Water

Especially in arid regions where water is too valuable to be disposed of after treatment, wastewaters can be cleaned to varying degrees by physical/biological/chemical means in a central treatment plant and then reused as cooling or process water for industry and utilities, as recreational or municipal water supplies, and, as discussed earlier, agriculture and recharge of groundwater (including prevention of saltwater intrusion along the coastline). Degree of waste removal will depend on the use and cost of the reclaimed water.

In theory, at least, wastewater effluent may be used as a source of drinking water, though public health officials in this country generally are nervous about the prospect. (Effluent is reused directly for drinking water at Windhok, South Africa, and drinking quality effluent from Virginia's Upper Occoquan plant will be discharged indirectly into a water supply reservoir.)

5. On-Site Waste Treatment and Disposal

Other alternatives to collection and central treatment systems include septic tanks, mounds, holding tanks, small aerobic treatment plants or other on-site treatment and subsurface disposal systems serving one or more principal residences or small commercial establishments. Small towns or widely dispersed sections of larger cities might find these alternatives attractive and feasible, as might communities hoping to minimize the impact of sewage treatment on growth. These on-site systems frequently will be less expensive than a centralized system.

The on-site alternative has become increasingly attractive since the 1977 Clean Water Act extended federal grant funds to either publicly or privately-owned on-site works under certain conditions. Individually-owned systems, designed to abate an existing pollution problem, must serve principle residences or small commercial establishments in existence as of December 27, 1977. A Facilities Plan prepared by a qualified local applicant must have certified that the individual system is cost-effective, that public ownership of the treatment works is not feasible, and that the treatment works will be properly operated and maintained (see Chapter III).

6. Sludge Management

Unfortunately, the pollutants removed from wastewater by traditional treatment do not vanish into thin air--they become a messy, mostly-organic substance called sludge. The higher the degree of treatment, the more sludge accumulates. In many communities--particularly large metropolitan areas--the worst wastewater treatment headache is what to do with the sludge. Indeed, sludge management systems can absorb 30 to 50 percent of the capital costs of a wastewater treatment plant.

Consideration of sludge management alternatives will be part of the analysis of every treatment system.

The chemical makeup of sludge must be known before disposal options can be studied. Sludge from systems receiving industrial waste often contain toxic chemicals or other components that require careful management. The only option open to many communities is some combination of incineration and landfill--though incineration to generate electricity, or pyrolysis (heating in the absence of oxygen in order to produce useful gases and organic compounds) may soon become practical alternatives. Ocean dumping of sludge is being phased out under federal laws.

More and more communities are disposing of their sludges by "land application"--if they are fortunate enough to have facilities that produce sludge which meets standards for toxic chemicals, salts, heavy metals, and pathogenic organisms. Though too low in nutrients to be a high-quality fertilizer, sludge is a good soil conditioner--good enough that most communities using land application disposal are able to find farmers willing or even anxious to offer their private property as the disposal site. Some communities take the additional step of composting their sludge before application to the land--this makes the sludge easier to handle and destroys almost all pathogens.

Late in 1978, EPA will issue new sludge management alternative guidelines and limitations to be followed in facilities planning.

(Table 7 summarizes sludge treatment techniques.)

How Is the Final Sewage Management Alternative Selected?

When the sewage treatment alternatives capable of meeting a community's specified effluent limitations have been identified, their monetary and other costs are compared. This comparson of alternatives, which leads to final selection, is completed within the framework of a cost-effectiveness analysis, the details of which are specified by EPA regulations and described in the following pages.

TABLE 7 SLUDGE TREATMENT TECHNIQUES

Adapted from EPA Technology Transfer, Environmental Pollution Control Alternatives: Municipal Wastewater

Treatment Process	Advantages	Disadvantages	Costs
Conditioning - chemical - heat	Facilitates separation of solids and liquids		$ 3-30/ton (chemical) $20-40/ton (heat)
Thickening - flotation - gravity			$ 4-26/ton (flotation) $ 4-10/ton (gravity)
Stabilization (not necessary for burning)	Breaks down organic solids bio-chemically, more stable, more dewaterable		
- anerobic	Produces useful by-product (methane)	Sensitive to variations in sludge feed	$30-40/ton (anerobic)
- aerobic	More stable operations, Recycles fewer pollutants to plant	Produces supernatent which must be recycled, Higher power costs, does not produce methane	$30-50/ton (aerobic)
Dewatering - sandbeds	Simple to operate and maintain	Large space requirements Affected by weather	
- vacuum filters - centrifuges - pressure filters	Smaller space requirements Not affected by weather		
Reduction - incineration - wet air oxidation	Eliminates dewatering step Minimizes air pollution potential	Creates toxic liquid which must be recycled, Complex maintenance problems	$40-60/ton (oxidation)

What is cost-effectiveness?

Cost-effectiveness is simply a description of how well a system achieves its objectives (the specified effluent limitations, in this case) in terms of its overall cost (economic, social, environmental). When it authorized federal construction grants, Congress built in cost-effectiveness analysis as a way to assure that those grants produce the maximum clean water possible per tax dollar invested without creating significant other problems.

According to recently published EPA guidelines, the most cost-effective waste management solution is the one with the lowest overall monetary costs (including capital, operation and maintenance costs over a 20-year period, calculated as lowest "present worth" or "equivalent annual value") that meets all federal, state and local requirements (such as water quality standards, NPDES permit requirements, water reuse or subsurface disposal requirements) without adverse non-monetary costs.

In cost-effectiveness analysis, all feasible types of waste management systems (listed in this chapter) are screened to identify those likely to meet all federal, state and local requirements. The alternatives that qualify are then analyzed to determine which might be the most cost-effective. In accordance with federal guidelines, monetary costs are calculated for each qualifying alternative, and non-monetary costs are quantified, if possible, or described qualitatively, usually during the environmental assessment process of the Facilities Plan (described on the following pages.) Nonmonetary costs might include primary and secondary environmental effects, implementation capability, energy and resources use, reliability and flexibility. The lowers cost alternative without other overriding problems is deemed most cost-effective.

The level of detail and sophistication required for this final analysis will vary with the size and importance of the project.

What are the monetary costs of wastewater management alternatives?

Monetary costs, the primary factor in determining cost-effectiveness, can be broken down into two categories: capital construction costs, and operation and maintenance (O&M) costs. All capital costs--those required for initial construction or major improvement of interceptors, wastewater treatment, discharge or reuse facilities, sludge handling equipment, repair on existing sewers--are eligible for federal grant assistance. (See "What will the federal government pay for?" Chapter IV) Specifically, capital costs include:

1) all contractors' costs of construction, including overhead and profit,

2) cost of land if it is an integral part of a treatment system or if it is needed for storage of waste prior to treatment,

3) relocation, and right-of-way and easement acquisition,

4) design engineering, field exploration and engineering services during construction,

5) administrative and legal services including costs of bond sales,

6) start-up costs, such as operator training,

7) interest during construction,

8) contingency allowances.

O&M costs of each alternative over the 20-year planning period are also calculated in the cost-effectiveness analysis, although these costs are not covered by federal grants. (Some state governments provide assistance to municipalities to cover part of the O&M costs.) O&M costs include labor, chemicals and other materials used in the operation of a facility, routine replacement of equipment and parts, and energy. Energy is a growing cost in wastewater management systems and the 1977 Clean Water Act direct the EPA Administrator to "encourage waste treatment management methods, processes and techniques which will reduce total energy requirements."

Offsetting revenues

In addition to the dollar costs associated with alternative treatment systems, some waste management techniques produce revenues that should be calculated against outlays to produce net monetary costs. For example, selling sludge for soil conditioning, marketing crops grown on public lands with applied effluent, selling effluent to farmers or industries, reduced costs of public water supplies, and selling reclaimed water to industries all provide financial benefits that are calculated in net monetary costs.

How is "present worth" or "equivalent annual value" calculated?

EPA guidelines provide that monetary costs of alternative systems are to be expressed as "present worth" or "equivalent annual value." Present worth (PW) is an economic method of determining how much money would be required now to pay for all anticipated costs (capital and O&M) during a specific period of time. Thus while federal funds are available only for construction costs, these funds are awarded only for the most economical project overall.

Present worth assumes that money received today, if not spent, will be invested at the prevailing interest rate and the value of the money at some future time will equal the original investment plus interest. For example, if a $100 expenditure will be made two years from now, the PW of this expenditure is the amount of money that will be worth $100 in two years if it is invested today at the prevailing interest rate.

The present worth of total costs equals the sum of the present worth of all capital and O&M costs over the 20-year period of the project. (See Appendix A for a further description of present worth.)

"Equivalent annual value" is another way to express project costs; it is expressed on an annual basis and not for the complete 20-year costs. The equivalent annual cost is the constant annual payment that is equivalent to the present worth if it is discounted each year and added over the 20-year life of the project.

If the present worth is secured in a lump sum through a bond issue and repaid with interest in equal annual payments, the payments would equal the annual cost.

What interest or discount rate does the federal government allow?

In making present worth calculations (and in other cases where interest or discount rates are used), EPA currently allows a 6-5/8 percent discount rate. (The discount rate is the assumed interest rate used to calculated the present worth of future money.)

The interest during construction of facilities is I x 1/2 PxC where:

I = the interest or discount rate
P = the construction period in years
C = the total capital expenditures.

If the construction period will be greater than three years, interest during construction is calculated on a year-by-year basis.

Is an inflation factor included in cost-effectiveness analysis, as allowed by federal guidelines?

Sometimes. Wage and price inflation usually is not considered, under the assumption that the rise in wages and prices will be roughly constant for all projects. An inflation factor is allowed, however, in two areas--natural gas prices and land values. The price of natural gas is to be escalated at a compound rate of 4 percent annually. In calculating the salvage value of land, the land value is to be appreciated at a compound rate of 3 percent annually during the planning period. Lands not held in simple, however, (such as a right-of-way easement) are not assumed to have appreciated at the same rate. The salvage value of these easements is assumed to be the prevailing market value of the easement land at the time of the cost-effectiveness analysis.

What service life is allowed by federal guidelines for treatment works?

In calculating the service life of treatment facilities for cost-effectiveness analysis, the following shall be used:

land = Permanent. Land is assumed to have an appreciated salvage value after the treatment facilities are no longer used. (See "inflation factors" above.)

wastewater conveyance structures (includes collection systems, outfalls pipes, interceptors, force mains, tunnels, etc.) = 50 years.

other structures (includes plant buildings, concrete process tankage, basins lift station structures, etc.) = 30-50 years.

process equipment = 15-20 years.

auxiliary equipment = 10-15 years.

All structures may have a salvage value if the anticipated useful life of a treatment facility is less than 20 years. The same may be true for equipment, if it can be demonstrated that a market exists for that equipment.

The present worth is reduced by the present worth of the salvage value of facilities and land at the end of the project period.

What are typical cost factors for each major wastewater management alternative?

The cost considerations for three major wastewater management alternatives are discussed in some detail below. Treatment and reuse systems are not discussed directly, since these systems will often use some combination of the first two options. The major difference, of course, will be the revenue value of reuse wastewater.

The cost considerations of improvements of existing facilities are too complex to generalize. The basic questions of sizing and service area, discussed earlier and below, will obviously affect costs. In the case of excessive infiltration/inflow, a sewer system evaluation will determine cost-effective sewer rehabilitation measures. Another part of the cost-effectiveness analysis will also recommend measures to reduce wastewater flows and conserve water.

Cost considerations vary for central treatment, land application and on-site facilities.

(1) Centralized physical/biological/chemical treatment costs. Wherever collection of wastewater and central treatment is included in an alternative--as in treatment and disposal, treatment and land application, or treatment and reuse--five major factors will affect the monetary costs of the system: (a) type of treatment technology selected, (b) the volume and makeup of incoming raw wastes, (c) size of the treatment facility, (d) service area, and (e) staging of construction. Site conditions for the treatment works, prescribed effluent limitations and reliability requirements (i.e. extra backup facilities required if there is a fresh-water intake downstream) may also contribute to monetary costs.

A centralized treatment system includes the treatment plant; interceptors and trunk sewers, if separate populated areas are linked; pumping stations and force mains (which move wastewater by pressure rather than gravity) used for connections between natural drainage basins; and the local sewer facilities, which include house connections, laterals, and submains. Of the total cost of a gravity-flow sewerage system, lateral sewers usually account for between 30 and 60 percent, larger pipes between 20 and 40 percent, and treatment plants between 20 and 40 percent.

The most cost-effective system will optimize the costs and performance of treatment plants, sewers, package plants and on-site disposal to produce the best overall system for a region. For example, potential economies of scale in plant construction and operation must be weighed against the rising costs of lining up separate populated areas by interceptors and force mains to create regional system.

(a) Types of waste treatment technology selected. Treatment plant costs are governed by volume of wastewater and the type of wastes to be removed. EPA has developed general cost estimates for treatment systems that remove wastes by means of secondary treatment (trickling filters, activated sludge and oxidation ponds or lagoons) and by disinfection and advanced waste treatment (phosphorus removal, filtration, carbon absorption, nitrogen control and land treatment). General estimates are also available for flow equalization and sludge treatment and disposal. (For information on the various factors leading to costs see EPA 625/5-76-012.)

(b) Industrial wastes and pretreatment. A municipality should examine the kinds of the industrial wastes discharged to its public system to find out whether it is more cost-effective for the community to treat these wastes in a municipal system and then bill the company for that cost, or whether the company should pretreat the wastes before discharging them to the central system. While the makeup of residential and commercial wastewaters is relatively constant, industrial discharges can be highly variable and require quite different removal technologies. Industrial waste frequently contains materials that actually may damage the biological process of a municipal waste treatment system.

(c) Size of the treatment plant. The size of the treatment facility is a major cost factor, and is determined by present and expected future population, per capita waste generation, industrial flows and excess capacity needed to accommodate growth. When deciding the size of its treatment plant, the community should consider economies of scale in construction and O&M and the expected wastewater flow over the life of the facilities.

The total costs for secondary wastewater treatment plants, both capital and O&M costs, as a function of average flow treated, are shown in figure 1. (This figure was developed from cost data that may be out of date. It is included here because the principle illustrated is still accurate. It should also be noted that no general figures can be simply extrapolated to a specific situation, as all cost factors are quite site-specific.)

This chart shows substantial economies of scale in both construction and O&M with greater economies accruing to large plants than to small plants. Phosphorus removal is not subject to such significant scale economies, particularly in O&M, since the largest cost is for chemicals which do not respond to scale economies.

Economies of scale are the major argument used in favor of building regional treatment plants. However, the high monetary cost of building collection systems and excess capacity for future users (which must be borne by current users) are often brushed aside by the decision to build a regional facility.

When is a regional treatment facility cheaper (in monetary costs) than several smaller ones?

Regionalization--the tying together of separate areas by construction of interceptors, trunk sewers and force mains for treatment at a large central plant--may be appropriate if the savings that result from a larger treatment plant offset the added costs of collection.

Many other environmental and land use considerations may signficantly affect a regionalization decision.

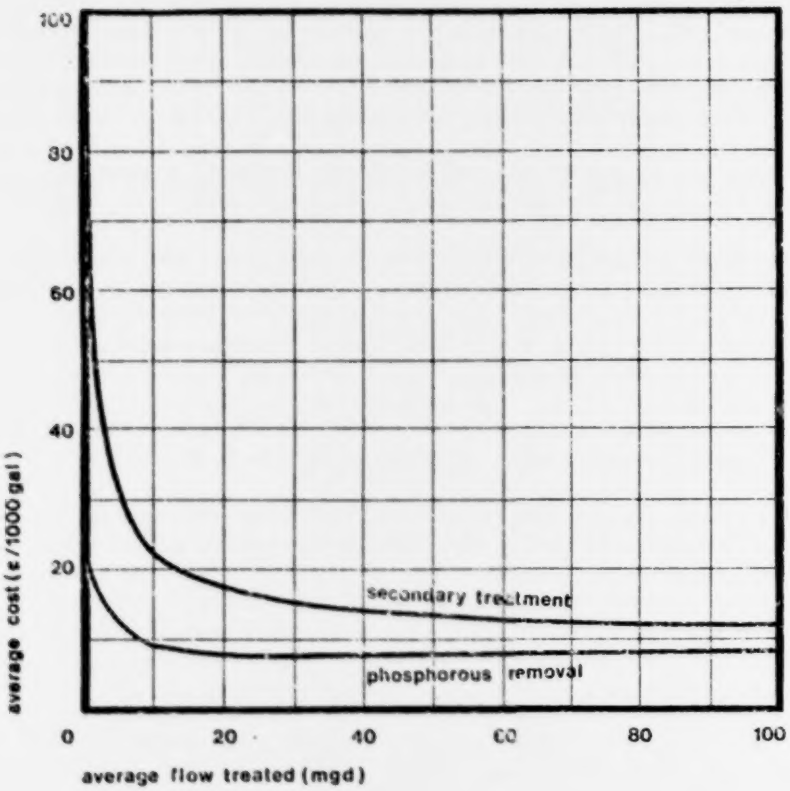
Generally, as the number of treatment plants decreases, so does the average cost of treatment; average costs of wastewater transport increase. The distance that wastewater can be economically transported varies greatly with the size of wasteload, the size of the receiving community and the terrain over which sewers must be built.

A further point to consider: The discharge of large amounts of effluent at a single point may have a different impact on receiving waters than the discharge of the same quality effluent in smaller amounts at a number of points.

Where can package treatment plants be used?

At the other end of the scale from regional facilities are package treatment plants that serve a small, contained population, such as an outlying suburb or small town. Package plants are small facilities that are partially or completely preassembled by a manufacturer and shipped to the designated location. They can provide primary, secondary or advanced waste treatment, though most are secondary, and come in various sizes--small ones for a single household, larger models to treat up to one million gallons per day. Package plants are usually less expensive than comparable facilities of the same size constructed in place. On the other hand, they often suffer from inadequate operation and maintenance.

FIGURE 2: TOTAL COSTS OF SEWAGE TREATMENT



Note: Costs adjusted to June 1975; amortization computed at 6 percent interest over 25-year life.

Source: Adapted from Robert Smith and Richard G. Eilers, "The Economics of Consolidating Sewage Treatment Plants by Means of Interceptor Sewers and Force Mains" (U.S. Environmental Protection Agency, April 1971), pp. 41 and 70.

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(d) Service area. The size of the area to be served by sewers and treatment facilties is closely related to the size of the treatment plant--the larger the area that pipes wastewater to the treatment plant, the larger the capacity of the plant must be. Defining the service area is partly a matter of costs, as well as environmental, political and administrative factors. If the service boundaries conform to natural boundaries--streams or riverbasins--cheaper, gravity-flow sewers can be used instead of force mains.

The economies of scale of a large treatment plant must be weighed against the possible higher costs of servicing larger areas of low density using interceptor sewers and force mains to connect natural basins to a regional treatment plant.

Overall effects of including low density areas in the service district may be positive. By servicing an area currently using septic tanks, ground water pollution may be avoided.

Before the 1977 Clean Water Act was passed, the decision whether to include an area with existing individual septic fields in a new sewered region was frequently made not on the basis of cost-effectiveness, but rather on the fact that federal funds were available for sewers but not for septic fields.

Replacing septic systems with sewers can lead to a host of associated environmental problems (the effects of new growth, or of concentrated effluent discharged in environmentally sensitive areas). Now that federal funding may pay to correct problems in individual septic systems, the merits of including areas served by septic fields in larger sewage treatment service areas can by evaluated more realistically.

The costs of sewers are pertinent in deciding service area boundaries. These costs, which include excavation and purchase and laying of the pipes, will vary according to soil type, depth of the trench dug, size of the pipe, minimum slope, minimum flow velocity, location of construction and groundwater level. Topographic factors also are important: costs are reduced if natural drainage basins are used, since adequate flow velocities are achieved naturally, without the need for deeper trenches. Laying pipe through rock rather than ordinary soil can push up excavation costs considerably. Cohesive soils are less expensive to excavate than loose soils. Flat areas and steep slopes cost more to sewer than moderate slopes, since they require greater excavation to meet minimum and maximum velocity needs. It also costs more to lay sewers in developed areas than in open country: streets must be dug up and replaced, utility lines moved and traffic rerouted.

Sewer construction involves several cost tradeoffs. The greater the service area, the greater the length of pipe required.

For gravity sewers, greater pipe length means greater average depths and thus higher excavation costs. For force mains, the longer the pipe, the more energy required for pumping.

There is a further tradeoff for gravity sewers. Increased flow results from larger pipes and from greater slope made possible by deeper trenches. But larger pipes cost more than smaller ones, and deeper trenches cost more to excavate.

Nevertheless, major economies of scale are achieved by increasing the size of gravity sewers. One estimate is that every doubling of capacity reduces the cost per 1000 gallons per mile by 29 percent.

In general, per capita collection costs usually increase with the size of the service area. Population densities tend to decrease on the urban fringes and per capita collection costs increase greatly as densities decrease.

(e) Staging. Which is cheaper, building new capacity through small expansions--every 10 years, for example --to meet increased need, or building capacity for 20 years growth now?

To determine the most cost-effective time to install collection and treatment capacity for a future population, it is necessary to compare the "present worth" of expenditures made in different staging schedules.

The practice of discounting future dollars in financial planning means that dollars spent in the future are valued less than dollars spent today--supporting the argument that expenditures should be deferred as long as possible. Economies of scale in treatment facilities also favor longer design periods with larger, but fewer, expansions. But as interest rates rise, the optimum design period decreases, since higher interest rates cause immediate expenditures to be given more relative weight. The design period also decreases with increasing growth rate, because as growth increases so does the investment needed to provide excess capacity for a given time period.

Changing land-use patterns also will affect the length of the design period. Laying sewers in a currently undeveloped area will be cheaper in real terms than sewering the area later when it is built up. This factor, like economies of scale, favors longer design periods. Because of the disruption factor, building interceptors in stages is generally more difficult and expensive than staging treatment plants. Furthermore, if construction is delayed on treatment plants, new and cheaper waste management or water conservation technology may become available. Also, when inflation rates are high, some communities consider it cheaper to construct excess capacity now, paying off low-interest bonds with devalued dollars and avoiding inflated construction prices later.

What requirements do EPA guidelines place on staging a treatment plant or interceptor?

The revised EPA cost-effectiveness guidelines provide that three alternative staging periods should be evaluated for treatment plants--10 years, 15 years and 20 years--and that the alternative with the least present worth or average annual cost be selected. Another selection method provided by the guidelines suggests that the staging not exceed the best period according to this table:

Staging Periods for Treatment Plants

Flow growth Factor (20 yrs)*	Maximum Initial Staging Period Qo 1MGD
1.3 or less	20 years
1.3 - 1.8	15 years
Greater than 1.8	10 years

A municipality may stage construction for a shorter period if adequately justified, but in no case for less than 10 years, because intervals that short do not allow enough time for planning, application for a federal grant and construction.

Any sizes or capacities of proposed treatment plant components that exceed the minimum reliability requirements spelled out in EPA's technical bulletin "Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability" must be approved by the EPA Regional Administrator.

EPA's proposed policy on the staging of interceptors, citing the influence on growth of interceptor location and length, states that interceptor routes shall be planned primarily to serve existing households. An interceptor may be provided in the initial stage to phase out or eliminate existing point source discharges and to accommodate flows from existing households. Otherwise, interceptors shall not be extended into environmentally sensitive areas, primary agricultural lands and other undeveloped areas (densities of less than one household per two acres).

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* Ratio of wastewater flow expected at end of 20-year planning period to initial flow when plant is expected to become operational (Q20/Qo).

When planned interceptors are routed through undeveloped areas to link two or more communities, EPA requires that the need for such systems be reevaluated, and alternative waste treatment systems be reexamined. In addition, the grantee must analyze and mitigate secondary impacts of such interceptors. Additional interceptors or extensions to interceptors may be added in the future to phase out additional point source discharges or to handle expected flows from new households. The location and sizing of interceptors shall not conflict with other approved environmental plans, such as 208 and air-quality plans.

EPA's proposed policy requires the sizing of interceptor pipes to be based on a 20-year staging period. The interceptor may be sized for a 40-year period only if it can be demonstrated that larger pipe is consistent with projected land-use patterns and that overall environmental quality would be improved.

When estimating peak flows in interceptors, consideration shall be given to:

- daily and seasonal variation in pipe flows, timing of flows and pipe storage effects;
- feasibility of off-pipe storage to reduce peak flows;
- use of an appropriate peak flow factor that decreases as the average daily flow to be conveyed increases.

How is the community likely to react to the combination of federal funding and federal regulation?

EPA's proposed sizing and staging policies (which will determine the eligibility for federal funds of all parts of the Facilities Plan) appear to take a sizable step away from previous promotion of centralized regional treatment facilities. The cost-effectiveness guidelines explicitly recognize that nonmonetary factors may in fact overwhelm the monetary incentives to regionalize.

The monetary portion of the cost-effectiveness analysis might not be as clear cut as it once appeared. There is increasing evidence that in many situations a smaller scale treatment facility carefully designed to serve existing populations and existing problems may prove to be less costly than large regional facilities. Now that federal funds may be used to pay for a greater variety of these small scale systems, they may receive renewed attention.

In spite of the new regulations and guidelines that encourage smaller facilities serving realistic populations and flows, the fact remains that the availability of federal dollars to cover 75 percent of the cost of facilities may be a tremendous incentive for a community to build the largest possible waste treatment facility.

Since there is no guarantee of future federal funds for treatment works and interceptor expansion, community decision-makers may face a difficult economic trade-off. If a newly constructed facility turns out to have too little capacity to keep up with actual population growth, for example, the community may have to pay all the costs of future expansion. On the other hand, building a facility now with far too much capacity for existing populations and future growth can mean that current residents will have to pay high initial user charges to support the unused capacity. This latter situation could prompt a strong push for new growth to reduce per capita user charges.

Land application costs. The monetary costs of disposing of treated effluent on land include the costs of conventional, primary or secondary treatment, whichever is required, as well as the cost of land, facilities to transport and store wastewater, spray irrigation equipment or other land application devices, and underdrains to recover renovated water.

Table 8 summarizes the characteristics of the three main types of land application systems.

The cost of these systems will vary depending on land costs, land application methods and transport methods. EPA estimates that for 1 mgd capacity, costs may range from 20 cents per 1000 gallons ($2.10 per month per home) to $1.09 per 1000 gallons ($11.45 per month per home), while at 10 mgd, they range from 14 cents per 1000 gallons ($1.50 per month per home to $1.00 per 1000 gallons ($10.50 per month per home). The cost of transporting wastewater to the site is not included.

Detailed cost curves for each of these land application systems components are available from EPA in "Costs of Wastewater Treatment by Land Application" (June 1975).

Land treatment offers many cost advantages. A very advanced degree of treatment is possible without generating any chemical sludges or using chemicals or activated carbon. Recycled water, nutrients and crops grown on the treatment area have market value. Large open-space areas are preserved with potential for multiple recreation use during the non-irrigation season. Land appreciates in value and represents a future resource to the community. Operating costs are less than for other tertiary processes. As a substitute for secondary treatment, (when state laws permit) land application can bring substantial cost-savings.

(Source: EPA, "Costs of Wastewater Treatment by Land Application, JE '75)

Table 8

COMPARATIVE CHARACTERISTICS OF IRRIGATION, INFILTRATION-PERCOLATION, AND OVERLAND FLOW SYSTEMS FOR MUNICIPAL WASTEWATER

Factor	Irrigation low-rate	Irrigation high-rate	Infiltration-Percolation	Overland flow
Liquid loading rate, in./wk	0.5-1.5	1.5-4.0	4 to 120	2 to 9
Annual Application, ft/yr	2 to 4	4 to 18	18 to 500	8 to 40
Land required for 1 mgd flow rate, acres *	280-560	62-280	2 to 62	28 to 140
Application techniques	Spray or surface		Usually surface	Usually spray
Vegetation required	Yes	Yes	No	Yes
Crop Production	Excellent	Good/fair	Poor/none	Fair/poor
Soils	Moderately permeable soils with good productive capacity when irrigated		Rapidly permeable soils such as sands, and sandy loams	Slowly permeable soils such as clay loams and clays
Climatic constraints	Storage often needed		Reduce loadings in freezing weather	Storage often needed
Wastewater lost to:	Evaporation and percolation		Percolation	Surface runoff and evaporation with some percolation
Expected treatment performance				
-BOD & SS removal	98+%		85 to 99%	92+%
-Nitrogen removal	85+%		0 to 50%	70 to 90%
-Phosphorus removal	80 to 99%		60 to 95%	40 to 80%

* Dependent on crop uptake

There are disadvantages, however, large land areas are required, ranging from 100 to 600 acres per mgd of capacity. In addition, large ponds and other storage facilities are needed to store effluent when the ground is frozen.

On-site facility costs. The cost of on-site waste disposal facilities--septic tanks, various means of upgrading septic tanks, mounds, and other facilities, as well as holding tanks--figures in the cost-effectiveness analysis when a community must decide whether or not to include outlying sites in a sewage service area. As described in Chapter IV, the funding of individual systems is now eligible for federal funds under certain circumstances. The question often is: Is it cheaper for a source to use on-site disposal, or be sewered?

Typically, septic tank costs include the tank, houseline, distribution box, absorption field, operation and maintenance (pumping and inspection) and the cost of financing. Per capita costs can be as low as $60 a year or as high as $150 a year, depending on system needs.

Soil conditions are a key cost factor. If soils are not conducive to good subsurface disposal, on-site disposal costs go up.

In addition to costs, the quality of treatment provided by on-site systems must be calculated. Sewer service may turn out to be more appropriate, even if more expensive for both technical and institutional reasons. For example, maintenance of groundwater quality may be a problem with on-site systems. In addition, it may be difficult for a central governmental body to assure the required maintenance of the individually-owned systems, as well as monitoring programs that will allow necessary surveillance of water quality.

What Are the Nonmonetary Factors in Choosing the Sewage Treatment Alternative? How Are They Weighed?

EPA's cost-effectivenes guidelines provide that before reaching the decision that one alternative is the most cost-effective, planners must weigh monetary factors against non-monetary considerations. Nonmonetary factors which are to be quantified, if possible, or otherwise qualitatively described, include primary and secondary environmental effects, implementation capability, energy and resource use apart from the economic consequences, reliability and flexibility of the system.

What primary and secondary environment effects must be weighed?

Primary effects--those directly related to location, construction and operation of the project--include impacts on ground and surface water quality, air pollution from incinerated sludge, odors, loss of open space or primary agricultural lands to treatment plant sites, destruction of wildlife or fisheries habitats, loss of historic or other vulnerable or valuable areas, erosion and noise during plant construction, and disruption of residences and traffic during sewer excavation.

The impacts of land treatment systems--positive or negative--include effects on soil and vegetation, possible ground water recharge, breeding of undesirable animal or insect life, and changes in ground and surface water quality. Positive environmental effects may include irrigation waters for parks or golf courses and associated recreational benefits, creation of greenbelts, preservation of open spaces, or control over community growth. Reclamation of sterile soils, such as strip-mined areas, and repulsion of saltwater intrusion into aquifers by groundwater recharge are further possible benefits. Reclaimed waters also may provide valuable supplies for municipalities, industries and recreation.

Both positive and negative environmental considerations are to be included in the cost-effectiveness analysis, developed more specifically in the environmental assessment and, if required, spelled out in detail in the Environmental Impact Statement (EIS).

The assessment must take into account health and safety considerations such as potential hazards at the plant and its immediate vicinity, or at a disopsal site or land treatment area. Transport of materials and effluent should be examined in this light, as should the health aspects of discharges, land treatment and reuse of pollutants and wastewaters.

Secondary effects are defined as indirect or induced changes in population, economic growth and land use and the environmental effects resulting from these changes. These effects may be much more significant than the primary ones, though more difficult to predict and quantify accurately.

Sewers and wastewater treatment facilities are key growth determinants in urban areas, sometimes having greater effect on land use than highways or zoning. How much excess capacity to build into treatment works, the drawing of service area boundaries and staging of construction are key decisions that can encourage or discourage growth (as discussed earlier in this chapter).

For communities that need and want growth, some facilities decisions can stimulate very positive economic and social opportunities. But in areas already pressed by rapid population growth and land-use changes, some wastewater management decisions may exert unwanted development pressures. In a fast growing region, for example, an interceptor laid across one of the few remaining open areas can bring strong pressures to build on that area. In this case, it may be more desirable to provide a package treatment plant--even though it costs more--than to include the outlying suburb in the service area by extending the interceptor.

Secondary environmental effects from growth and sprawl are numerous: air pollution from traffic to new suburbs, shopping centers, large industrial parks or recreation centers; excessive energy consumption; water pollution generated by runoff in newly built-up areas. Paving over groundwater recharge areas might lead to long-term lowering of the water table and consequently reduced municipal or industrial water supplies. Unfavorable service area decisions or construction of oversized interceptors or regional facilities may induce unwanted urban development that infringes on open space, recreational areas, historic sites or primary agricultural lands. The location of treatment plants also can be indirectly related to development impacts, since these facilities affect the location of interceptors.

Ways to mitigate adverse environmental effects are described in Chapter VII.

How are environmental factors analyzed?

Potential environmental impacts of proposed projects are identified and discussed in an Environmental Impact Assessment (EIA), which is an integral part of every facility plan. If the EIA indicates that the recommended alternative will cause significant environmental impact, then a full Environmental Impact Statement (EIS) will be written by EPA under the requirements of the National Environmental Policy Act.

The Environmental Impact Assessment is prepared during local facilities planning as part of the analysis of different sewage management alternatives, usually (though not always) by the same consultant who prepares the Facilities Plan itself. The EIA differs from the EIS in its level of detail, scope of analysis, and in the government jurisdiction responsible for implementing it. The content of the EIA is the substantive basis for the decision by EPA to prepare a full Environmental Impact Statement.

What are the contents of the Environmental Impact Assessment?

Regulations governing the preparation of impact statements require the following information in the EIA:

1) description of the existing and future environment without the project, including adequate documentation of these descriptions;

2) an environmental, social and economic evaluation of waste treatment alternatives with special attention to long-term impacts, irreversible impacts, and induced impacts such as development; and

3) a description of primary and secondary environmental impacts of the proposed action, including any unavoidable impacts and any steps that might be taken to mitigate and minimize adverse impacts.

If EPA decides to prepare an EIS, the information contained in the environmental assessment will be used to prepare the larger document.

How and when does EPA decide to prepare an Environmental Impact Statement?

When a grantee's EIA is completed, EPA reviews it to determine whether or not to conduct a full Environmental Impact Statement. If EPA finds potentially significant adverse environmental impacts not immediately amenable to mitigation, the EPA Regional Administrator gives notice of intent to prepare an EIS.

EPA's regulations require that an EIS be prepared for a facilities plan under the following circumstances:

1) the plan will induce significant development and land-use changes;

2) major parts of the treatment works are located on productive wetlands or will significantly and adversely affect the habitat of endangered species;

3) the treatment works will have significant adverse affects on public lands and recreational and historic opportunities;

4) the treatment works will have a significant adverse affect on air or water quality, noise, and/or on fish and wildlife habitat;

5) the effluent limitation for pretreatment works reflects water quality standards that are insufficient to protect "present or future uses;"

6) the treatment works will cause significant social dislocations (such as population displacement or destruction of a residential area) or will adversely affect significant amounts of possible agricultural land.

If it is apparent at the outset of facilities planning that significant adverse environmental impacts will occur, EPA may decide at that time to conduct a full EIS.

In a cooperative approach called "piggybacking," EPA may arrange at the outset of facilities planning for the community's consultant in effect to prepare the EIA and EIS at the same time. EPA personnel will work with the consultant throughout his study, dealing with problems as they arise. When an EIS is "piggy-backed," a community is assured that a full consideration of environmental impacts is conducted throughout the facilities planning process. In addition, delays in the award of a Step 2 grant caused by tacking on the EIS to the middle or end of Step 1 are minimized.

If EPA determines that a sewage treatment project will not result in significant environmental impacts with significant adverse affects, the Regional Administrator will issue a formal Negative Declaration to allow for public review of that decision. This Negative Declaration must be issued 15 days before any administrative action which moves the project forward to another stage. A brief environmental appraisal must be available for public review at the time the Negative Declaration is issued.

How will I know if an Environmental Impact Statement is to be developed for my community's Step 1 grant?

Although the criteria for preparing an EIS would seem to give appropriate attention to all projects where significant environmental impacts are anticipated, a closer look at the regulatory language reveals a great deal of flexibility for interpreting these criteria. The fact is, EPA prepares an EIS for only 5 percent of construction grants projects. The limited resources available to EPA and the existence of public controversy are more likely to determine which projects are scrutinized than are objective environmental criteria.

EPA retains responsibility for preparing the EIS--even when a program has been substantially delegated to the state--yet, the state water quality agency is likely to play a significant role in the decision to undertake it. The state agency certifies the adequacy of the EIA and will inform EPA if there appear to be significant adverse environmental impacts. The details of coordinating delegated state agency programs with EPA's responsibility for the EIS are not yet fully resolved, but it seems likely that EPA will rely on information provided by the state agency in making its decision.

What are the contents of an Environmental Impact Statement?

The Environmental Impact Statement will contain much of the same information contained in the Environmental Impact Assessment--but in more detail. EIS regulations require the following information in the body of the statement:

1) background and description of the proposed action;

2) alternatives to the proposal action (including the alternative of no action);

3) a description of the short and long-term primary and secondary environmental impacts of the proposed action;

4) adverse impacts that cannot be avoided if the project goes forward;

5) the relationship between local short-term uses of the environment and maintenance and enforcement of long-term productivity;

6) irreversible and irretrievable commitments of resources to implement the proposed action; and

7) problems and objectives raised by other governmental entities.

What factors influence a system's reliability and flexibility?

The reliability of a collection, treatment and disposal or reuse system refers to the probability that the system will meet its objectives. Traditional, well-tested treatment devices that are well operated rank high on the reliability scale since their operating and design parameters are well known.

For example, a major advantage of a trickling filter secondary system is its basic simplicity, which permits incoming loads of pollutants to vary over a wide range during the day without causing operating problems. This minimizes the need for operator skills. The mechanical equipment is also simple, and energy requirements are low. (But treatment efficiency falls off considerably when temperatures drop in the winter, and the system may cause insect and odor problems.)

As another example, phosphorus removal by coagulation-sedimentation is a simple, well-proven process that provides reliable removal of BOD and suspended solids. (But large quantities of chemical sludge are generated.)

In times of energy shortages, excessive energy requirements may affect reliability of the system. Some land application systems, for example, require considerable amounts of power to move wastewater from its source to the land treatment site.

A system that incorporates flow equalization measures may improve the overall efficiency and reliability of the treatment process.

The flexibility of a system refers to its capability to meet future needs--expansion of treatment capacity, extension of sewers to service new areas, or upgrading the level of pollutant removal by adding new components. For example, can modular components be added for phosphorus removal, nitrogen removal or different sludge handling processes? Alternative systems should also be evaluated for their flexibility in converting from treatment and discharge systems to wastewater reclamation and reuse or pollutant reuse.

The most flexible alternative of all may be the one most conducive to cost-effective staging of treatment plant construction.

What Political/Institutional Factors Influence the Choice of a Wastewater Treatment Alternative?

Governmental institutions have a major impact on whether and how well waste management alternatives are implemented, since agencies of government--federal, state and local--ultimately approve the final alternative and implement it through financing, construction, user charges, industrial cost recovery schemes, and operation and maintenance. Before EPA will approve a Facilities Plan (prior to awarding a Step 2 grant), implementation and management authority either must be held by appropriate governing bodies or be available soon.

Besides legal authority to implement a facility plan, local or regional agencies or special districts must show the ability to finance construction, operation and maintenance to meet federal and state requirements.

As a matter of practical politics, local governments favor local control over wastewater management services within their boundaries. This attitude may work against a regional treatment alternative or against land treatment in some outlying areas because distributing the costs of a regional system among the local jurisdictions is often a touchy subject in local politics. If a suburb currently is served by a package treatment plant or on-site facilities for instance, its residents and officials aren't likely to want to pay to be connected to a large urban system, despite the fact that their participation makes the regional system more viable.

Local treatment facilities that must be approved by a regional planning or policy body may encounter opposition if local objectives conflict with regional growth, land-use, or water quality goals. If approval of a treatment alternative is not likely to be forthcoming from the necessary jurisdictions, the alternative will be rejected as "unimplementable."

What legal considerations affect the choice of a sewage treatment alternative?

When choosing a treatment option, planners must be aware of constitutional and statutory requirements of federal, state and local governments which can make a difference in whether a plan will be implemented. In addition to the water quality laws and regulations discussed previously, planners should observe the following legal provisions:

Federal government. To receive a federal grant, an applicant must meet many legal requirements such as the Environmental Impact Statement requirements of the National Environmental Policy Act and laws that forbid discrimination on the basis of race, color, national origin or sex. See Chapter I for a list of some of these federal requirements.

State and local governments. Many states have laws and constitutional provisions that could affect the choice of a wastewater management alternative. For example:

- Water rights provisions, particularly in Western states, can affect the viability of land treatment systems. A system that reduces flow in the watercourse for a downstream user may violate the water rights of that user.

- Public health laws may affect disposal of sludge, restrict the application of effluents to lands for irrigation or subsurface disposal, or limit building of ponds if they encourage mosquito or rodent populations. Other public health concerns for land application include possible drifting of aerosol, potential spread of infection, bacterial contamination of vegetables, and groundwater pollution.

Most detrimental health and hygiene aspects of land application can be greatly reduced by proper wastewater pretreatment and handling of effluents.

- Most states have laws and regulations that govern on-site waste disposal facilities and municipal water supplies, whether from reused waters or other sources.

- Land use and comprehensive planning laws of state or local governments may require that municipal facilities conform to comprehensive land-use plans or other land-use requirements, or be approved by regional or other substate government agencies.

- Energy use and conservation provisions of state governments may apply in certain jurisdictions.

- States also have a variety of laws and constitutional provisions that govern powers of local governments, such as financing authority, acquisition rights and ownership capability; some provisions of wastewater management may need special authorization from state government.

How Is the Wastewater Management System Financed?

How the various alternatives are to be financed, the eligibility of a system for federal assistance and the financing of costs not covered by grants are crucial considerations in selecting the best management system. For example, if two alternatives are equally cost-effective but one has greater construction costs which are eligible for federal funding, and the second has greater O&M costs, which must be borne locally, a community probably will choose the former.

The costs eligible for federal funding were discussed in Chapter IV. Financing the local share of construction and operation and maintenance costs presents a complex set of issues (see Chapter II).

How will a community finance its share of construction costs and O&M costs?

After federal construction grant funds are received, 15 to 25 percent of construction costs (depending on the level of state assistance) will remain to be financed. Added to this will be O&M costs, which the federal government does not finance, though there are federal requirements to develop a satisfactory O&M plan as a condition of receiving the construction grant. Frequently, system components that are not eligible for federal funding can drive the local share of costs to well over 25 percent.

Local costs can be financed in a number of ways: with general tax revenues, special assessments on property value, frontage assessments, connection fees, lot size assessments, user charges, and industrial cost recovery. Several of these revenue-raising devices can be used simultaneously to finance different portions of a sewerage system.

Some communities require developers to install lateral sewers and house connections; the developers then pass the costs on to home buyers. Local jurisdictions may divide up financial responsibilities with towns responsible for mains and submains, special sewer districts for laterals and the county for the interceptors and treatment plant. By special agreement, a large city may treat the wastes of a surrounding rural county once the county collects the wastes.

Financing devices vary in economic efficiency, equity, ability to raise adequate funds and administrative simplicity. For example, using general revenues spreads treatment costs among all taxpayers and imposes no marginal costs on users--and consequently ranks low on economic efficiency. By contrast, periodic service or user charges, based on the extent of use or some surrogate measure of use, provide an incentive for the user to reduce his discharge to the sewer system. Thus, user charges are said to be economically efficient.

Another revenue mechanism, taxes based on property values, can be imposed once or periodically.

Connection fees--one-time expenses to be paid when the user begins service--are usually flat charges baed on lot size and frontage. They may be imposed once or periodically, but in either case provide no incentive to reduce the load on the wastewater management system.

Ad valorem assessments imposed by service districts (such as a sanitary district or local government) on property within a special district are a form of property tax paid by residents of the service area. They can be a one-time tax or a periodic levy. Ad valorem taxes are more specific to actual users of treatment facilities than general revenues but are not as closely related to use as service charges. Special districts have used these ad valorem taxes to pay for debt amortization (of the community's share of capital expenses) and O&M expenses.

From 1974 until passage of the 1977 amendments, the federal government did not allow the use of ad valorem taxes to satisfy user charge requirement of the Federal Water Pollution Control Act. In 1977, however, Congress approved their use as residential and small nonresidential user charges if EPA approves.

User charges are variable assessments based on actual discharges to sewers, or surrogate measures such as fees based on water use, which is metered in many cities. A percentage of the water bill thus can be levied for wastewater management. (Water use is closely but not directly tied to wastewater discharges since some water may be used in the yard or garden.) Wastewater flow meters may be economical for use on industrial or large commercial sources of wastewater to accurately assess user charges.

What are the user charge provisions of federal law?

Every federally-funded project must have a system of user charges to assure that each recipient of waste treatment services will pay his proportionate share of the cost of O&M, including replacement of equipment to maintain capacity and performance over the life of the facility. User charges are intended both to provide an economic incentive to pollution sources to control wastes and to promote self-sufficiency of O&M at the treatment works. Factors such as strength, volume and delivery flow rate characteristics are to be considered in developing a user charge system.

Residential user charges can be assessed by metering sewage or water supply, ad valorem taxes or other systems in which the user is notified of the portion of his payment attributable to waste treatment services. If meters are not used, users with similar flows and wastewater characteristics may be grouped into categories and user charges set so that each class pays its proportional share of treatment costs.

User charges must be reviewed annually and adjusted to reflect actual O&M costs. Charge systems must be authorized in municipal law. Quantity discounts to large users are not permitted--savings resulting from economies of scale are apportioned to all users or user classes. If user charges are based on a percentage of the water use charge, the water charge must be based on a constant cost per unit of consumption.

EPA regulations (Appendix B, 40 CFR Subpart E, Part 35) provide three model user charge systems (described in more detail in Appendix A to this book).

What are industrial cost recovery (ICR) provisions?

In addition to user charges to cover O&M costs, industrial users must pay a share of construction costs attributable to the control of specific pollutants they discharge that otherwise would not enter the system. Small industrial users are exempt if they discharge no more than 25,000 gallons per day of sanitary waste (or its equivalent in process waste) that does not disrupt operation of the treatment plant or the utility of sludge.

During each year of the industrial cost recovery (ICR) period--30 years or the useful life of the treatment works, whichever is less--the industrial user must pay its share of the total amount of the federal grant, divided by the recovery period that is allocated to his use. At a minimum, the industry's share must be proportional to the ratio of its flow to the flow capacity of the treatment works. Strength and volume must also be considered in setting ICR charges.

The industrial user's share shall include only that portion of the grant attributable to the part of the treatment works he actually uses or has reserved for future use. Unallocated treatment works capacity is not charged to him. The grantee (the community or region) retains 50 percent of the industrial user charges and sends the remainder to the U.S. Treasury. A minimum of 80 percent of the resulting local income plus interest must be used solely for expansion or reconstruction of treatment works associated with the project. The remaining 20 percent (of the 50 percent) may be used at the discretion of the grantee.

Considerable controversy has surrounded implementation of the industrial cost recovery requirements, particularly in communities that have sought to encourage industrial development and want to offer cost-free pollution control as an added incentive.

Industry in fact already receives a substantial federal subsidy when it treats its waste in a federally-funded, publicly-owned treatment works--industrial users' share of the facility's cost cannot be charged interest on its share of the capital investment in the treatment facility. (Just imagine the size of your total house payment if it contained no interest component.)

Nonetheless, in 1977 amendments Congress directed EPA to study the efficiency of and need for payment by industrial users and report back within 12 months. Furthermore, during the 18-months following the date of the 1977 amendments, EPA cannot require grant applicants to enforce ICR provisions. Charges for these 18 months will be due after that period unless Congress changes the Act.[4]

A Case Example - Choosing the Alternative

This is the actual case of a small town in the Southeast that currently has no public management of wastewater. The facts and circumstances are taken from the town's facility plan and presented here to show how treatment alternatives are evaluated.

The town's population: 3150. A Water District provides water service to 436 people through 170 water meters, of which 150 are located in the town itself. The District includes 19 small businesses, one factory and an elementary school. The District proposes to provide sewerage service--it has prepared a 20-year wastewater facilities plan and applied to EPA for grant assistance.

The planning area is about 2,300 acres. Overflowing septic tank systems are the only source of wastewater discharges--there are no known point sources of wastewater effluent. About 20 percent of the homes are located on soils with very low permeability, which probably causes the periodic failure of the septic tanks.

The area's population is relatively stable, and the District currently has a moderate growth rate, adding about four customers a year. The factory, however, plans to expand. Population is expected to grow by 50 to 100 percent in the next 20 years.

The District sees a public wastewater system as a key ingredient for future growth and improvements and as remedy for the current disposal practices, which generate health hazards and environmental pollution.

Some wastewater management alternatives were initially rejected. Upgrading existing facilities--more than 130 septic tanks and pit privies, inadequately designed and poorly maintained--to current septic tank technology was considered impracticable, because the impermeable soils were expected to make individual disposal systems inadequate.

Regional solutions were much too costly--as the nearest existing treatment facility is 17 miles away. The capital costs of sewers, force mains and pumping stations to deliver the District's small flow to that plant would exceed $1 million, nine times the cost of any local alternative.

Monetary Evaluation

The District analyzed the complete spectrum of waste treatment alternatives and evaluated four basic alternatives in detail. Cost-effectiveness analyses were prepared for these choices:

- Alternative No. 1. A conventional gravity sewer system with a central treatment facility. The least expensive treatment option was an oxidation lagoon, followed by an infiltration-percolation land treatment system. Another option--aerated reactor tanks followed by soil infiltration-percolation--was rejected as slightly more expensive.

- Alternative No. 2. Similar treatment process, but most of the sewer system would employ effluent sewers, where solids in wastewater are removed by septic tanks and stored near each source, and only the liquid effluent from the septic tanks it pumped to the central treatment site. The effluent sewer system consists of interceptor tanks and siphons or heavy duty sump pumps, with small diameter plastic sewer lines carrying effluent to a central oxidation pond for additional treatment.

- Alternative No. 3 was developed to further reduce total costs. It involves the use of short stretches of "effluent sewer" (similar to sewers in Alternative No. 2) but the septic tank effluent would be carried directly to a disposal site. At least 122 customers would be grouped on short sewers and the effluent disposed of at 22 separate "community" sites. It is also recommended that new individual disposal systems be provided for an additional 22 customers. Provision of services to the elementary school and to the factory would be an option that would not affect the relative costs of the four alternatives but could reduce the average charges per customer. Even without the school and industry sharing the costs, the user costs for this alternative would be significantly lower than for the previous two --user costs were estimated to be just 58 percent of those required for Alternative No. 2, while present worth was about 21 percent lower than Alternative No. 2 and 42 percent lower than Alternative No. 1.

- Alternative No. 4 was considered for purposes of comparison. It consisted of on-site disposal for the all of the 144 customers included in Alternative No. 3. Critical problems of implementation and design caused this alternate to be rejected.

The present worth calculation for the four alternatives follows:

ALTERNATIVE NO. 1

A. Conventional Sewer System:
Present Worth - Gravity System

Initial Capital:	$339,600
Operating Costs, year 1-20:	9,000
Salvage Value at end of 20 yrs:	169,800
PW of initial capital:	339,600
PW of operating costs= $9,000x11.354=	102,186
Total:	$441,786

Less: PW of Salvage Value= $169,800 x 0.3045 =	(-) 51,704
Net Present Worth:	$390,082

Present worth is calculated by adding up initial construction cost, operating costs, (when operating costs change during the 20-year period, two costs and two factors are used; these are then multiplied by a factor converting operating costs to a present worth). The present worth of salvage value and land is then subtracted. (These costs are presented here in summary form. In an actual Facilities Plan the construction costs would be broken down in more detail, as shown in Table 7.)

B. Two-acre lagoon:

Initial Construction Capital	$69,990
Land Capital (may be donated)	10,500
Present Worth of Operating-Maintenance Cost, yrs. 1-20= $1,000 x 11.354	11,354
Total	$91,844
Less: Salvage Value at 20 yrs.: -(23,340 + 10,400) x 0.3045 =	(-) 10,274
Net Present Worth	$81.570

C. Disposal Basin:

Present Worth--Infiltration Basin

Initial Construction Capital	$16,770
Present Worth of Expansion Capital= $3,200 x 0.552	1,766
Present Worth of Annual Operation & Maintenance, yrs. 1-10=$3,000x7.317	21,951
Present Worth of Annual Operation & Maintenance, yrs. 11-20= $4,000x7,317x0.552	16,156
Total	$56,643
Less: Present Worth of Salvage Value of Permanent Improvements and Land at 20 yrs.: (1,920+7,060)x0.304	(-) 2,730
Net Present Worth	$53,913

Before selecting an infiltration basin, sand filtration and spray irrigation were considered as disposal techniques. These were rejected as more costly than infiltration.

TOTAL COSTS (components A, B, C) ALTERNATIVE 1. $525,600

ALTERNATIVE NO. 2. Effluent Sewer System with Central Oxidation Pond and Infiltration Basin

Sewer System

Initial Construction Capital		$196,700
Present Worth of Expansion Capital		18,018
Present Worth of Constant Operating Cost = $5,860 x 11.354		66,534
Present Worth of Varying Operating Cost = $40 x 85.594		3,424
Total Present Worth of Sewer System		$284,676
(Initial Capital) $98,350 x 0.3045		29,948
Present Worth of Salvage Value of Expansion Capital $33,000 x 0.237	(-)	7,820
Total Salvage Value	(-)	$37,768
Present Worth of Treatment Lagoon (from Alternative No. 1)		31,600
Present Worth of Disposal Basin (from Alternative No. 1)		53,900
Net Present Worth		$382,000

ALTERNATIVE NO. 3. Community Subsurface Disposal System

Initial Construction Capital		$226,800
Present Worth of Expansion Capital		43,243
Present Worth of Constant Operating Cost = $6,110 x 11.345		69,372
Present Worth of Varying Operating Cost: $60 x 85.594		5,136
Subtotal		$344,551
Less: Present Worth of Salvage Value: (75,600 + 61,700) x 0.0345	(-)	41,807
Net Present Worth		$302,744

These calculations assume a 74-gallon per capita wastewater flow and an average occupancy rate of 2.7 persons per household. All existing septic tanks would be modified or replaced to provide two settling compartments and improved design of overflowdevices. The unit cost for this improvement is $200. An electric pump would be installed near or as a part of each septic tank. Homes were grouped in several patterns to meet the sometimes conflicting goals of lowest cost, simplicity of operation, disposal in more suitable soils and amenability to future growth.

All on-site or off-site wastewater facilities would be publicly-owned and managed, including septic tanks, sewers and treatment-disposal facilities. Public management is considered essential to overcome poor on-site subsurface disposal. Easements or subsurface development rights would be purchased from private land owners.

ALTERNATIVE NO. 4. Community Management of Individual On-Site Disposal

Initial Construction Capital		$190,200
Present Worth of Expansion Capital		41,000
Present Worth of Constant Operating Cost = $5,000 x 11.354		56,770
Present Worth of Varying Operating Cost = $60 x 85.594		5,136
Subtotal		$293,106
Less: Salvage Value at 20 yrs. = ($63,400 + 18,000) x 0.3045	(-)	24,786
Net Present Worth		$268,320

Total on-site disposal by individuals eliminates part of the land acquisition and ownership costs raised in Alternative No. 3. Only utility easements would be needed to provide access to facilities for maintenance and repairs by the Water District.

SUMMARY OF PRESENT WORTH FOR THE FOUR ALTERNATIVES

	Alternative			
Item	1	2	3	4
Sewers	$390,100	$246,900		
Treatment	81,600	81,600		
Disposal	53,900	53,900		
Total	$525,600	$382,400	$302,700	$268,300

By avoiding the costs of sewer construction and maintenance, Alternative No. 4 would have the lowest capital and operating costs, therefore, the lowest present worth. However, about 20 percent of existing occupied structures are located on soils that severely limit on-site disposal.

The next lowest in present worth was Alternative No. 3, the community subsurface disposal system, which was 11 percent more expensive than No. 4. However, the cost estimates of Alternative No. 3 were more likely to be accurate since it had fewer uncertainties in construction and operation. Thus, nonmonetary factor were more significant in deciding between the two.

Nonmonetary Evaluation

Primary and secondary environmental effects. All four basic alternatives would meet the effluent criteria and other environmental criteria. In the actual Facilities Plan the environmental effects were qualitatively evaluated in detail and then assigned a number from 1 (best) to 4 (worst). (The quantified environment effects of the four basic alternatives are summarized in Table 8.)

Alternatives No. 1 and No. 2 had considerably larger erosion losses because of construction of conventional gravity sewer systems and lagoons with disposal in an infiltration basin. Alternatives No. 1 and No. 2 tended to produce significantly more noise because of sewer construction.

As for development effects, conventional gravity sewers were considered to stimulate slightly more growth and new industry to move to an area where excess capacity exists in a sewerage system. Thus, Alternative No. 1 was considered to have greater potential for secondary impacts than 2, 3, and 4. However, this is a rural community, and other factors, such as labor supply, transportation, etc., are at least as influential on growth as sewer service. Thus, all alternatives were considered to have only slight secondary impacts.

Implementation. All alternatives could be implemented legally by the Water District. Alternatives 3 and 4 are less common techniques, therefore, could require additional time for local, state and federal approvals. However, since Alternatives 1 and 2 may require a trained operator, and in any case require more local funds, potential users may object to the user charge.

Since the Water District would operate wastewater services, and is an organization known to and generally approved by local users, it is likely to perform satisfactorily to implement construction, operation and maintenance, as well as collecting user fees and recovering industrial costs. Also, Water District Commissioners would have legal authority to require use of the system. The fourth alternative is likely to be particularly difficult to implement since 20 percent of the homes are located on soils with low permeability.

Generally, none of the alternatives has any overwhelming advantage for implemention.

Alternative No. 2 was considered better than No. 1, since removing 70 percent of suspended solids and 50 percent of BOD in the interceptor tanks reduces the organic load in the stream and reduces the environmental effect of accidental discharges from the sewer system. Alternative No. 3 was considered ecologically sound since accidental sewer discharges are minimized and nutrients are returned to the land.

Alternatives 3 and 4 also avoid the need to upgrade treatment facilities to meet changing standards for effluent discharges to surface waters. Alternative No. 3 minimizes system complexity and reduces O&M costs. Alternatives 3 and 4 also have more rational planning of community growth since strip growth could be encouraged by conventional sewers. Alternatives 3 and 4 would not produce odors, while odors may occur from a treatment facility.

In general, environmental effects did not differ greatly for the four alternatives, partly because of the small size of the project, lack of truly sensitive environmental features and the relatively slow rate of growth.

Plan Selection. Public hearings were held on the alternatives after the costs and effects from each were predicted. Generally, Alternative No. 3 was preferred due to lower total cost and simplicity of operation. The cost of community wastewater management was thought to about equal the cost of privately maintaining and replacing existing septic tank systems--about $7 per month for an average user charge. By contrast, the conventional sewers and central treatment was expected to cost $15 per month.

Alternative 3 was selected by the community and funded by EPA.

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CHAPTER VI

PUBLIC INVOLVEMENT IN FACILITIES PLANNING

What Are the Broad Requirements for Public Involvement Under the Clean Water Act?

Recognizing the federal environmental programs would need strong grass-roots support to be effective, the 1972 version of the Clean Water Act contained a broad directive for public involvement at all levels of water quality decision-making. These requirements are found in Section 101(e):

> Public participation in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan, or program established by the Administrator (of the Environmental Protection Agency) or any State under this Act shall be provided for, encouraged, and assisted by the Administrator and the States. The Administrator, in cooperation with the States, shall develop and publish regulations specifying minimum guidelines for public participation in such processes.

What's In It For You? Why Get Involved?

Let's face it: A sewage plant lacks the public appeal of a new park, town hall, or highway. The average citizen has little, if any, interest in sewage treatment processes and problems, unless they pose some personal threat to him, his family, or his community. A foul-smelling treatment plant in the neighborhood, sewage seeping up in the street, or escalating treatment costs will grab his attention. But not planning. But when you get right down to it, wastewater facilities are essential to a community. They can significantly enhance or degrade its environment, depending on how well they are planned.

Good planning means more than just professional competence. It means considering a community's character, its environmental and social values, and the attitudes and desires of its citizens. These qualities can only be incorporated through concerted efforts to involve the public in all phases of the planning process.

Public participation makes good sense for several

Some portions of this chapter are based on manuscript written by Char White.

reasons. Open discussion and citizen input can help planners develop plans that reflect community values and concerns. Controversies can be identified early and resolved through compromise and open airing of the issues. Citizens get a chance to have a "say" in how federal and local monies are being spent in their communities. And public involvement in community issues gives participants a stake in the project's long-term benefits.

Incorporating public values

Local residents often have a more intimate understanding of particular community problems than the staff or consultants working on project. Their information is pertinent and up-to-date; they know the community's values, concerns, and goals; and since they will be living in the area long after a project is completed, they are in the best position to decide the future of their community.

Better plans

Public discussion and advice can help the consulting engineer to fine-tune a facility plan to fit the community's special circumstances. Alternative technologies and facility locations must be explored and their ramifications discussed and understood. Citizens can work with the professionals to identify the range of issues that must be considered and can alert the engineers to impacts of special concern.

Assuring reasonable costs

Virtually all wastewater treatment facilities are planned and constructed with public money, and therefore the public has the right and even the responsibility to participate in determining how that money is spent. Increasingly, people want to have a say in how federal dollars will be used in their communities. Across the country, communities have sometimes been wary of accepting federal or state funds for fear of hidden secondary costs. Because it emphasizes public participation, the water pollution control program can foster a working partnership between the public and government so long as attitudes of open planning and mutual problem solving prevail.

Added community benefits

The real payoff of that partnership may come in the form of long-term community benefits. Citizens who participate in planning a project will develop a sense of continuing responsibility for it. They will be the ones who will walk the extra mile to secure added benefits--shoreline protection, swimming, boating, biking, and so on--that make the difference between an ordinary project and an outstanding one.

Voter support

Most communities will need voter authorization for municipal or pollution control bonds to pay the local share of project costs. Voters who have taken part in planning and who feel they've had a chance to influence the decision-making process will most likely support local financing plans and encourage their friends, neighbors, and community organizations to do the same. People attending public hearings to learn about the project for the first time as a bond election approaches will probably not be so easily convinced.

Resolution of controversies

Controversial issues are bound to crop up in facilities planning, particularly in large-scale projects. It is far better to debate these issues publicly early in the planning stages so that reasonable compromises can be worked out; when the public is kept in the dark, disagreement often erupts too late to make changes in the project without additional expenditures or delays. The engineering consultant who is in touch with community opinion will be able to foresee controversy and can spend more time working with residents to find acceptable alternatives.

Which Major Federal Regulations Give You Access to the Facilities Planning Process?

The requirements governing public participation in facilities planning are principally derived from two sets of federal regulations--40 CFR Part 25, "Public participation in programs under the Resource Conservation and Recovery Act, The Safe Drinking Water Act, and the Clean Water Act," and 40 CFR Subpart E, Part 35.917-1(g) and 35.917-5.* These regulations differ both in breadth and specificity. They can be valuable tools for you during the facilities planning process, particularly if you meet resistance from "official" participants. (See "What Problems Might Be Encountered in Implementation of Public Participation Requirements?" at the end of this chapter.)

These EPA regulations attempt to provide an optimum blend of general goals and objectives for public participation (which can be met by any number of mechanisms selected by the grantee) and more specific requirements. They adopt an active (as opposed to passive) tone, exhorting public officials to seek out and encourage involvement of various segments of the public in decision-making. This activist approach is summarized in the definition of public participation in Part 25:

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* The regulations referred to here have not yet been promulgated, but are in final stages of approval at EPA, and should appear in final form in the Federal Register in February.

> Public participation is that part of the decision-making process through which responsible officials become aware of public attitudes by providing ample opportunity for interested and affected parties to communicate their views. Public participation includes providing access to the decision-making process, seeking input from and conducting dialogue with the public, assimilating public viewpoints and preferences, and demonstrating that those viewpoints and preferences have been considered by the decision-making official.

The general public participation requirements of Part 25 apply to:

- EPA activities such as rulemaking, issuing permits and informational materials, significant strategy and policy guidance, and decisions to delegate program activities to state control;
- Developing and implementing activities supported by EPA grants to state, interstate and substate agencies; and
- State administration of certain programs for which responsibility has been delegated by EPA: the Construction Grants Program, State Hazardous Waste Program, NPDES Permit Program, Dredge and Fill Permit Program.

Part 25's general public participation requirements therefore govern all Construction Grants Program activities.

Specific additional requirements for public participation in facilities plans are found in 40 CFR Subpart E, Part 35.917-5, Grants for Construction of Treatment Works.

Other requirements are found in specific program regulations:

- 40 CFR Subpart E 35.915(d): state priority system and project priority List;
- 40 CFR Subpart E, Part 35.928-1: approval of Industrial Cost Recovery System;

- 40 CFR Subpart E, Part 35.929-2(e): General Requirements for all User Charge System;
- 40 CFR Subpart E, Part 35.940-1(t): Allowable Project Costs;
- 40 CFR Subpart E, Appendix A, Part 8(3): cost-effectiveness analysis guidelines;
- 40 CFR Subpart F, Part 35.1033: state management assistance grants; and
- 40 CFR Subpart G, Part 35.1507-8, 1533: grants for Water Quality Planning Management and Implementation.

The requirements recognize essential differences in the levels of participation to be expected for different kinds of projects. They therefore set up two-tiered approach to public involvement in facilities planning, specifying minimum requirements that virtually all construction grant recipients must meet and some additional requirements to be met only by projects that appear to justify a more intensive effort.

The Basic Public Participation Program

All Step 1 projects awarded after the date of promulgation of these regulations must meet basic minimum requirements for public involvement. Step 1 projects begun before that date will proceed according to previously approved work plans. If these old Step 1's come in for significant grant amendments, however, or decide that an upgraded public participation program would be useful, appropriate public participation requirements may be negotiated.

The regulations describe a Basic Public Participation Program (BPPP), which is the minimum standard for projects except those that the EPA Regional Administrator determines involve only minor upgradings of treatment works or minor sewer rehabilitation. But even those minor projects are not exempted from a required public hearing and public disclosure of costs. Any exemptions from the BPPP must be decided in a public forum. The Regional Administrator must issue a notice of intent to waive public participation requirements and must allow 30 days for public response that might indicate serious local issues that should override the proposed waiver.

To meet the requirements of the basic program a grantee must:

1. develop a public information program designed to bring about public involvement from the earliest stages of the decision-making process. This program must:

- be a continuing program that provides policy, technical information and assistance, and that highlights significant issues;
- include the creation of one or more central collections of important reports, studies, plans and other documents relating to significant decisions or controversial issues. These collections should be housed in convenient locations such as public libraries;
- include the development and maintenance of a mailing list focused on the publics that are or should be interested in the facilities planning process.

2. A program for consulting the public that begins with the selection of the professional consulting engineer and the Plan of Study and continues throughout the facilities planning process. Grantees must provide for early consultation preceded by timely distribution of information.

3. The Plan of Study submitted with the Step 1 grant application must contain an outline of the public participation program that the grantee plans to follow throughout Step 1 process--including:

- a description of the consultation and information techniques to be used;
- the staff and resources to be devoted to it;
- a schedule for proposed public participartion activities; and
- a description of the publics that will be targeted for involvement.

Because the Plan of Study must be submitted before the Step 1 grant award and is not funded by EPA, a more extensive (although still brief) public participation workplan must be submitted to EPA no later than 45 days after the Step 1 grant award. In this workplan, the staff and budget for public participation are to be allocated to categories of activity; specific consultation points where responsiveness summaries (see below) will be prepared are to be noted; and the method of coordinating the Section 208 public participation program with the facilities planning program is to be described.

4. To ensure public awareness of both the project and the public participation opportunities, the workplan and a fact sheet about the project are to be widely distributed to interested groups and individuals. The fact sheet should contain information describing the project, the staff for the project (including the engineer and the grantee staff contact) and any preliminary estimates that are available concerning additional per household costs for upgrading sewer service in the community.

5. The grantee is specifically required to "consult" with the public in the early stages when the grantee and consultant begin assessing the current and future situations and screening alternatives (but before selecting the actual alternatives to be evaluated during cost-effectiveness analysis). A reponsiveness summary must be prepared and distributed after this public consultation.*

6. A public meeting must be held when the cost-effectiveness analysis of the alternatives has been largely completed, but before the alternative plan has actually been selected. This consultation process must also be accompanied by a responsiveness summary that is distributed to the public.

7. A public hearing is to be held in the community to discuss the recommended alternatves prior to the adoption of the facilities plan.

8. A final responsiveness summary and an evaluation of the effectiveness of the public participation program are to be included in the facilities plan that is submitted to EPA (or the state) for final approval.

The Full-Scale Public Participation Program (FSPP)

For complex projects of important community significance that justify a more intensive public involvement effort, the regulations outline a Full-Scale Public Participation (FSPP) Program comprised of all elements of the basic program plus a few additional ones. The Regional Administrator must order a full-scale public participation program under the following conditions:

- when EPA prepares or requires the preparation of and Environmental Impact Statement;

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* A variety of consultative mechanism may be utilized to meet this requirement--workshops, public meetings, task forces, etc. Some of these mechanisms are described in the companion volume to this book entitled Municipal Wastewater Management: Public Involvement Activities Guide.

- where the advanced wastewater treatment (AWT) is required to meet stringent, effluent standards (AWT) will be defined by EPA guidance. The currently accepted definition is treatment requirements of less than 10 milligrams of BOD per liter plus nitrogen removal.);

- where the Regional Administrator determines "that more active public participation in decision-making is needed because of the possibility of particularly significant effects on matters of citizen concern, as indicated by one or more of the following:"

  - changes in land use and/or impacts on environmentally sensitive areas;

  - significant increases in treatment capacity, amount of sewered area, or construction of new treatment and conveyance systems;

  - substantial increased total cost to the community or to users;

  - significant public controversy;

  - significant impact on local population or economic growth; and

  - substantial opportunity for implementation of innovative or alternative wastewater treatment technologies or systems.

In addition to meeting the public participation requirements of the basic program, a grantee with a full-scale public participation program in its community is required to:

1. Hire or designate a public participation coordinator who will be responsible for carrying out the public participation workplan throughout the facilities planning process. The coordinator can be a member of the grantee staff, a staff person hired by the grantee's consultant, or a representative of a public interest group within the community. (For example, a local civic leader with grass-roots ties throughout the community may make an ideal public participation coordinator.)

2. Establish an advisory committee shortly after acceptance of the Step 1 grant award. Regulatory requirements establish the membership, responsibilities and resources of this committee. These requirements were designed to ensure that the advisory committee encourages the continued attention of a core group of informed citizens--in a manner that complements other

public participaton mechanisms--without becoming the sole mechanism for public involvement. Membership requirements also are designed to ensure that people who do not normally have regular access to the decision-making process be can singled out for service on advisory committees.

Some of the most important requirements that apply to advisory committees are:

- Affirmative action is required on the part of the grantee to ensure a balanced membership, consisting of substantially equal proportions of private citizens, representatives of public interest groups, governmental officials, and citizens with substantial economic interests. Private citizen representatives should not have any direct financial gain or loss at stake greater than that of the average homeowner, taxpayer, or consumer. The public interest groups should be organizations acting out of general concern for the area and should not reflect the direct economic interests of their membership.

- The grantee is required to designate (or have his contractor designate) a staff contact responsible for day-to-day liaison and coordination between the advisory committee, the grantee and the grantee's consultant. This staff contact may or may not be the public participation coordinator. In either case, the staff contact must be located in the project area, not based in another city. The staff contact must be identified as a budget item in the grant agreement.

- The grantee must establish an operating budget and identify the professional and clerical staff time that will be made available to the advisory committee.

- Reasonable out-of-pocket expenses of advisory committee participation will be reimbursed by the grantee. The total dollar amount and the actual items eligible for reimbursement will be established by the grantee after negotiation with the advisory committee.

- The advisory committee may on the request of the grantee assume responsibility for the overall public participation program. The committee also will make written recommendations to the grantee, as appropriate, on major decisions or upon the request of the grantee.

- The advisory committee is reasonably independent: it may select its own chairperson, adopt its own rules, and schedule and conduct its own meetings. These meetings are to be open to the public.

- Advisory groups are urged to conduct public participation activities in conjunction with grantee, and to solicit outside advice. They are encouraged to form subcommittees and ad hoc groups or task forces in order to continually expand committee membership and to draw on other resources outside the membership.

Many other specific requirements that establish the roles and responsibilities of advisory committees are spelled out in the EPA general regulations on public participation (Part 25). You should read them over if you want to understand this critically important component of the full-scale program.

3. The full-scale public participation program requires that a public meeting be held early in the facilities planning process at the time when current and future situations are being identified and initial alternatives are being screened. (The basic public participation program simply requires an unspecified "consultation" at this point.) After this meeting the grantee is to prepare and distribute a responsiveness summary (see below).

4. EPA has developed a technical training package for advisory group members and local officials, which the grantee should arrange to have provided to the advisory group early in the facilities planning process.

Other public participation requirements applicable to the basic and full-scale programs

Many other requirements apply to how public participation programs are carried out; some address the important issues of compliance and enforcement. To completely understand the public's right to involvement, you must read carefully the relevant regulations.* Some of the most important ones are listed here:

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* The regulations are listed on pages 164 and 165. They may be obtained from the Regional EPA office, or may be located in the appropriate Federal Register volume in public libraries, or by writing to the Government Printing Office in Washington, D.C.

1. Agencies are encouraged to provide free copies of important documents to the public. When not available for free, however, the charges for such documents should not exceed prevailing commercial copying costs in that area. In other words, if you could go to a commercial copier and have a document copied for $.25 a page, a local government grantee or his consultant should not charge you $2 a page to copy that document. If you come up against apparently excessive charges for copies of information, you should request an explanation from the grantee or consultant. If such explanation is not satisfactory, you may wish to complain to the EPA Regional Administrator (or the State Agency) regarding the adequacy of the grantee's public involvement effort.

2. In an attempt to define what constitutes adequate public notification of major decisions for which an agency is seeking public input, Part 25 specifies that responsible agencies must provide written notice to those people who appear on the required mailing list or applicable portions of that list, as well as to the media. To ensure that notice of impending decisions is provided far enough in advance to allow meaningful public response, such notice is to be generally not less than 30 days (except in the case of public hearings or meetings).

3. All public hearings on facilities plans (or any other decision covered by Part 25) must meet certain minimum requirements:

- notice mailed in time to be received by potential participants 30 days prior to the date of the hearing (except in emergency situations possibly posing imminent danger to public health);
- The notice is to contain information on the issues to be discussed at the hearing, and any tentative determinations that have been made, as well as information on the location of relevant documents;
- Relevant documents must be available to the public 30 days before the hearing;
- Hearings must be held at times and locations that will encourage public attendance and involvement;
- time must be reserved for unscheduled testimony during the hearing. Decision-making agencies are encouraged to hold a question and answer period before public presentations at the hearing; and

- A complete hearing record is to be prepared and made available at no more than cost to anyone who requests them.

4. Public meetings requirements are somewhat less formal than those of public hearings. They are subject to the same notification requirements however. Meetings must also be held in locations and at times that will encourage public involvement. The notice requirement for public meetings is also 30 days.

5. Responsiveness summaries are a major tool developed by EPA to assure not only that the public is asked for its input, but that the asking agency in fact responds to the input it receives. The responsiveness summaries, required at specific points in the facilities planning process by regulation (and when specified by the public participation workplan), will be used by the state agency and the EPA Regional Office to determine the adequacy of the public involvement effort. They must contain the following information:

- the public participation activity conducted;
- the issues on which the public was consulted;
- a summary of the public views; and
- the Agency's specific responses to the public views (modifications to the proposed action or explanation of why the public views were rejected).

An evaluation of the public participation program must be submitted by the grantee as part of the final responsiveness summary at the conclusion of the facilities planning process when the facilities plan is submitted to the state or to EPA for approval. For full-scale programs that have an advisory committee, a separate evaluation from the committee should accompany the responsiveness summary.

How Will Public Participation Regulations Be Enforced? Who Will Enforce Them?

Responsibility for ensuring compliance with public participation regulations will fall to either the EPA Regional Office or to the state water quality agency (in states where that agency has been delegated the management of the construction grants program). The reviewing agency must analyze the public participation outline (a component of the Plan of Study) before it ever awards the Step 1 grant to be certain that there is a reasonable expectation of meeting the public participation requirements during the facilities planning process. No grant is to be awarded unless EPA is satisfied that these requirements have been met. Even in the case of a delegated program, EPA still has the responsibility for final award of the Step 1 grant. If you are concerned that public participation will be inadequate in your community, you will first make that case to the state agency. If it is not responsive, you will wish to contact the EPA Regional Administrator and make your point at that level.

EPA (or the state agency) is required to evaluate grantee compliance with public participation requirements at various stages when the Facilities Plan is in progress and after it is completed. Using the workplan, responsiveness summaries and other available information, the overseeing agency must judge the adequacy of the public participation effort. At a minimum, this evaluation must take place both during a mid-project review that EPA conducts in conjunction with its regular oversight activities, and at the end of the facilities planning process. If EPA or the state determines

that public participation activities have not been adequate, the reviewing agency is required to take whatever actions it deems appropriate to mitigate the failures and prevent them from being repeated in the future. The enforcement action that EPA is required to take is fairly minimal--it must simply impose more stringent requirements on the grantee for the next funding cycle. But there are much more powerful enforcement actions available to EPA: it may terminate or suspend the grant, withhold payments, and ask for its money back. It will be up to you, the concerned citizen, to see that appropriate enforcement actions beyond the minimum are in fact taken.

How Will These Regulations Affect What Happens in Your Community?

The federal regulations described above simply provide a framework for the development of a public participation program. In fact, given the number of institutional actors involved, the only thing you can be certain the regulations will accomplish is providing some minimum level of funding eligibility for public participation activities during the facilities planning process.

The regulations will also establish a skeletal outline of a public participation program for your community. How that outline is fleshed out will be partly up to you and partly up to the local government recipient of the Step 1 grant. You will want to work with the grantee in your community to ensure that:

- the public participation program imaginatively meets the needs of your community;

- the significant publics in your community in fact participate in the facilities planning process;
- the publics that are asked to be involved are sufficiently informed of the issues to participate affectively; and
- the views of the public are listened to and responded to by the grantee and his consultant.

How Should a Public Participation Program Be Developed? What Will Be Its Major Components?

Designing a public participation program is (and should be) the responsibility of the local government grantee, but the informed citizen leader can be an invaluable resource. In fact, EPA regulations require consultation with the public in program development.

As noted earlier in this chapter, a grantee entering the Step 1 planning process must provide a brief outline of a public participation program in its Plan of Study. EPA has emphasized the brevity of this outline because the development of the Plan of Study is not eligible for construction grant funds. Nonetheless, this early outline will be extremely important since its provides the basis for funding of public participation activities during the Step 1 process. It must contain enough information to allow EPA or the state agency to decide whether the proposed public participation program is adequate. As the grantee is required to consult with the public during the development of the Plan of Study, you may have an opportunity to influence the course of the facilities planning process at this point.

No later than 45 days after the Step 1 grant award, a more detailed--though still brief--public participation workplan must be submitted to the reviewing agency. The local grantee is specifically directed to distribute the workplan to interested groups. Although the brief outline in the Plan of Study is subject to public consultation, the workplan need only receive such scrutiny as is given by the advisory committee.

If you believe that the public participation program outlined and approved in the Plan of Study is inadequate, the workplan developed after the Step 1 grant represents a second chance. A revised program submitted as part of the workplan may even provide the basis for a grant amendment to increase the dollar resources spend on public participation in Step 1 planning.

Tables 9 through 15 at the end of this chapter are designed to help you to develop a Plan of Study outline and a workplan. Table 1, a 201 Public Participation Planning Guide, divides the important community issues of the construction grants program into 26 separate decision points, beginning before the Step 1 grant award and ending after the Step 3 grant award. Issues to be resolved at each decision point are briefly identified and discussed, public participation requirements are listed, and optional, additional activities are recommended.

Tables 10 through 15 provide model public participation outlines (required during the Plan of Study) and workplans (required 45 days after grant award) for both the basic and the full-scale programs. You may wish to encourage the grantee in your community to use some version of these model workplans in its submissions to EPA. (Please note that these workplans were designed for communities of roughly 5,000-10,000 people. Your public participation workplan may vary considerably depending upon the size of your commuity and the scope of your project.)

When you become involved in developing the public participation workplan, you will find that you must address three decisions at the outset:

1. identifying major community issues to be addressed during facilities planning, including among others--

- growth, land-use issues;
- sensitive environmental areas;
- costs to the community and per household; and
- industrial discharge problems (pretreatment needs, extra capacity needs, etc.).

2. identifying the publics in your community that should be particularly targeted for public involvement; and

3. identifying appropriate mechanisms for your community in developing a public participation program.

When these initial decisions are made, the key issues remaining will involve setting up opportunities for public participation in your community. The factors that affect these opportunities will be:

1. identfying appropriate staff and budget resources to ensure that public participation activities take place;

2. identifying and scheduling of decision points where it will be most appropriate to seek public involvement in the decision-making process;

3. identifying and developing information, materials and training opportunities to facilitate public involvement.

The important facilities planning issues you are likely to encounter in your community are discussed throughout this manual (Please refer to Table 2 for a further discussion of the issues and their relationship to the public participation program.)

Two other major decisions determine the scope of the Step 1 public participation program--identifying the public and identifying the mechanisms to reach these publics.

Who is the public?

Government officials who grapple with the requirements of 101(e)--or other mandates for public participation--often begin with the question, "How do I identify the public?"

It can be argued that there are four publics: (a) the general public, popularly known as "the man in the street"; (b) the organized public, whose citizen activities are channeled through organizations; (c) the representative public, made up of elected and appointed officials; and (d) the economically concerned public--those individuals and institutions whose interests may be affected, adversely or favorably, by water quality policies and decisions.

Each of these publics obviously has a right to express itself on all issues, and their input should be sought at appropriate times. The organized public, however, has already demonstrated its interest in the issues and its determination to be heard. All public participation programs should seek ways to involve organized publics that have particular power and interests in the community and that are likely to be affected by the results of the facilities planning process.

As you develop a Step 1 public participation program, you should also be particularly attuned to ways that facilities planning issues touch the interests of publics in your community not normally involved in water quality issues.

Major new treatment facilities or extensive expansion of interceptor sewers will affect all segments of a community in some manner. Certainly the local share of financing and operating and maintaining the facilities will be borne by the community as a whole. Some segments of the public, however, may be more affected than others depending on the proposed project.

Extending interceptor sewers into an agricultural area will certainly concern farmers and ranchers. Pressure for new residential and commercial growth may push up land values, forcing farmlands out of production because of higher taxes. When facility planning contemplates service to rural areas and/or expansion of interceptors through agricultural or ranch lands, farmers, ranchers, and rural organizations like the Farm Bureau should be informed of the planning and encouraged to participate in evaluating alternatives and potential mitigation measures.

Expanding interceptor lines to rural areas may also contribute to deterioration of the inner city as residents, businesses, and service organizations relocate in the new suburbs. Low income and ethnic populations that are unable or unwilling to move may be forced to cope with dwindling services and inferior living conditions as city resources are redirected to developing suburban areas. Inner-city jobs may also be affected as businesses shift to the suburbs; inner-city residents may have to commute long distances to their jobs. Neighborhood organizations, labor unions, and ethnic groups who will likely be affected by such a population shift should be involved in any facility planning that may induce significant new suburban growth.

Potential deterioration of environmental quality will concern many community organizations and may have significant impact on specific segments of the public. Potential air quality deterioration, for example, will have special consequences for the elderly and the chronically ill. Environmental and public health organizations should be involved in resolving these issues, as well as any solid waste problems generated by sludge disposal or degradation of underground water supplies or wetlands.

Environmentalists will also be worried about potential destruction of natural areas, animal habitats or biological systems. Bird watchers and nature photographers may want to participate in decisions that affect natural areas, while sport fishermen will have a stake in preserving aquatic life. Professional fishermen will have concerns about potential water quality deterioration caused by increased urban and construction runoff.

Aesthetic deterioration that could occur in the vicinity of the treatment facilities themselves will be of special concern to nearby property owners, neighborhoods, and to civic and business associations in the area. Early involvement of these groups as well as beautification, parks and recreation organizations may eliminate controversies over location of the facility and provide for mitigation of site and odor problems.

What Are the Public Participation Tools?

Public participation can cover a wide range of activities designed to inform and involve the public. Most of the mechanisms of public participation fit into one of three categories, as indicated by the chart below:

Education/Information	Review/Reaction	Interaction/Dialogue[*]
Newspaper Articles	Public Hearings	Workshops
Radio and TV Programs	Survey Questionnaires	Special Task Forces
Speechs and Presentations	Public Inquirers	Interviews
Field Trips	Public Meetings	Advisory Boards
Exhibits		Informal Contacts
School Programs		Study Group Discussions
Films		Seminars
Brochures		
Newsletters		
Reports		
Letters		
Conferences		

Some of these mechanisms (workshops, newsletters, coalitions) can be initiated by either citizens or by public officials. Others, however, (public meetings and hearings) remain exclusively with the powers of public officials.[**]

Obviously, different mechanisms are used for different publics. For example, an information program aimed at the general public should be designed to:

a. Generate interest;

b. Provide enough information on the legal and regulatory framework to enhance public undestanding; and

c. Provide access to planning documents and other relevant information;

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[*] Katherine P. Warner, "Public Participation in Water Resources Planning," University of Michigan, Ann Arbor, 1971.

[**] The book entitled *Municipal Wastewater Management: Public Involvement Activities Guide*, designed as a companion piece to this book, describes in more detail various public involvement tools.

d. Provide information on opportunities for public participation; and

e. Elicit reaction to potential decisions.

In a program for the general public, these points are listed correctly in describing order of priority. An information program aimed at the organized public, however, would give its greatest emphasis to the last three purposes and, ideally would include an additional purpose:

f. Provide technical assistance for citizens groups seeking to effect community goals and to explore different ways to meet those goals.

Many citizens organizations are knowledgable about interpretating statistics, computerized data, and highly sophisticated reports. Such groups should be given opportunties to respond to the most up-to-date information about a given program. A program that makes information public should be more than merely a device to communicate decisions already made.

As you design a public participation program that fits within the framework of EPA regulations, be creative in your interpretation of these regulations. Certain parts of the regulations may be more flexible than is initially apparent. For example, both the basic and full-scale public participation programs require public meetings to consider the issues raised at specific decision points. A public meeting, however, is simply a gathering of individuals to interact face-to-face. There are many different kinds of public meetings. For example:

- meetings designed to accomplish a task;
- meetings designed to identify and negotiate conflicts;
- open forums simply intended to air a variety of viewpoints; and
- large mass meetngs to present basic information.

Public meetings also may be sponsored in different institutional frameworks. For example:

- the advisory committee in a full-scale public participation program may hold a working public meeting designed to broaden input from other publics on specific issues;
- the grantee may hire the local chapter of the League of Women Voters to sponsor an open forum on specific issues;

- an already scheduled town meeting may focus its attention on facilities planning issues needing resolution.

Even the apparently rigid structure and roles of advisory committees specified by regulation sometimes lend themselves to flexible interpretation. Variations can be expected in different communities in:

- membership (what economic interests are represented? What types of local government officials, of public interest representatives?)
- size (will the advisory committee have 10 members of 30 members?)
- roles and responsibilities (will the advisory committee have some responsibility for the execution of the public involvement program? To what degree will the advisory committee periodically expand its membership through ad hoc task forces?)

What Problems Might Be Encountered in the Implementation of Public Participation Requirements?

A historical perspective

The development of the public participation regulations described in this chapter was begun by EPA in October 1977 at the request of five national environmental organizations--The Conservation Foundation, National Wildlife Federation, Natural Resources Defense Council, Sierra Club and Institute for Public Interest Representation (Georgetown University Law Center). In a June 21, 1977 memorandum to EPA Administrator Douglas Costle, these organizations stated:

> Despite both the emphatic language of 101(e) and the apparent recognition by EPA of the significance of public participation, EPA has yet to issue regulations that fulfill the promising and exacting public participation requirements of the [Clean Water] Act.

Agreeing that the public participation efforts of EPA and of implementing agencies at the state and local level had been deficient, Thomas Jorling, Assistant Administrator for the Office of Water and Hazardous Materials, began the effort to rewrite the rules for public involvement.

Between 1972 and the end of 1978, the public participation requirements were initiated primarily by a few forward-looking administrators with appropriate implementation authority. The rules of the game were vague indeed. Regulations issued on August 23, 1973, (40 CFR, Part 105) were in fact performance standards that set limited *goals* and *objectives* to be met by a public involvement program but virtually no requirements. (For example, implementing agencies were to develop an information program, a program of early consultation with various publics, etc.). Program regulations--which were to provide specific requirements--usually referred back to Part 105 and failed to specify any other public participation requirements other than an occasional public hearing.

Even the few requirements that did exist (i.e., a public participation summary that would allow an approving agency to make a judgment concerning the adequacy of public involvement) were virtually ignored. EPA never issued criteria for judging the adequacy of public involvement programs. In fact, even the eligibility of public participation programs for construction grants funding has been the subject of some confusion. With no clear-cut regulatory directive declaring public involvement to be grant-eligible, some EPA regions and states determined that some public participation activities were not grant eligible.

The new Part 25 regulations (replacing Part 105) are surprisingly similar in approach to the old regulations. They consist mostly of performance standards and leave to the implementing agency or to the specific program regulations the mechanisms and timing of the public involvement program. There are, however, significant differences:

1. New Part 25 pays a great deal of attention to criteria for judging the adequacy of public involvement. The goals and objectives of public participation are clearly stated.

2. Although specific public involvement techniques are not *required* by Part 25, when they are required in program regulations they must be carried out in a specific manner. For example, public meetings must take place on 30-day notice, advisory committee membership must be equally balanced among private citizens, public interest groups, government officials and economic interests, etc.

3. The reasonable costs of public participation activities are clearly stated to be grant-eligible items.

4. All grant programs must outline an adequate public participation work element (in the case of the Construction Grants Program, the Plan of Study outline fills this requirement) before receiving the grant award.

5. Responsiveness summaries required periodically throughout the facilities planning process will assist EPA oversight responsibilities regarding the adequacy of the public participation effort.

6. The EPA has obligated itself to provide technical assistance and training to advisory committees formed to participate in the facilities planning process.

7. Simply by revising the regulations, EPA has signaled a change. The agency has effectively said --to the public and to implementing institutions--that public participation efforts under old regulations were not successful, and that public participation programs will be taken far more seriously in the future.

Institutional resistance

It is perhaps for this last reason that proposed public participation regulations--which took such modest steps toward changing the rules--evoked such controversy at all levels of government. Some EPA Regional Offices, and many state agencies and local governments submitted comments on the proposed regulations that decried any specific requirements for the development of a public participation program.

Some of their objections were:

- the limited financial and staff resources available to oversee and/or implement the regulations;
- the large number of federal regulations that local and state governments already have to deal with in the Construction Grants Program; and
- a feeling that the specific requirements of the regulations would be insensitive to local institutions, problems and opportunities.

Other reasons for institutional resistance to public involvement in facilities planning may be:

- a lack of understanding on the part of the engineers who have run the program that there are political and social value judgments involved in the technical decisions that lead to the selection of a waste treatment management alternative;
- a lack of understanding of how to interpret public participation regulations on the part

of those charged with interpreting them. Encouraging effective public involvement is a specialized skill in the same way that engineering a treatment facility is a specialized skill. At this point the people who are charged with implementing public involvement programs are largely the same people who are engineering the facilities. The development of creative and meaningful public involvement programs will probably require hiring public participation specialists.

The development of a meaningful public involvement program in your community may well require perseverance on the part of informed citizens. You will want to work closely with the local government grantee and with the consulting engineer to ensure that public involvement programs:

- closely track the decision-making process to ensure maximum input without causing substantial delays;
- identify important community issues at early stages in the decision-making process; and
- target the important affected and interested publics in your community.

Local apathy

A final problem you might incur in developing a public involvement program is lack of interest among the various publics in your community. This apathy may be caused by one of three conditions:

- lack of understanding of how the facilities planning process touches the lives of the people in the community;
- the proposed project may be only one of a number of important issues currently drawing on the volunteer time of people in the communty; and
- the proposed project may have truly minimum impact on the community.

It is important to remember that different projects and activities generate different levels of interest in the community. In some cases, no matter what your efforts, there is no way you will be able to turn out 300 people for a public meeting on a minor sewer rehabilitation project, for example.

In many cases, however, you will be able to actively encourage public involvement by pointing out to various groups how their interests coincide with or are affected by the facilities planning process (see "Who is the Public?" in this chapter).

What Are the Pewards of Public Involvement in the Facilities Planning Process?

It is important to remember that the ultimate purpose of public involvement in facilities planning is cleaner water at a lower environmental, economic and social cost. Only careful public scrutiny can ensure:

- that the Facilities Plan meets the present and future needs of the community;
- that all the relevant environmental, economic and political data necesary to ensure effective implementation emerges;
- that appropriate measures are taken to mitigate negative impacts; and
- that a community develops a committment to continued oversight of the operation and maintenance of the facility.

Table 9

FACILITY PLANNING
PUBLIC PARTICIPATION PLANNING GUIDE

	Decision Points	Public Participation Requirements *	Issues to be Resolved	Recommended Public Participation	Discussion
1.	State delineation of facility planning areas.	Only as incorporated statewide water quality management planning public participation requirements. No action specifically required here.	a) Are boundaries sufficient to assess potential environmental impacts? b) Do they allow for maximum treatment options? c) What are the political and institutional implications?	a) Fact sheets stating criteria for boundary determination. b) Public notification through media, press and direct mail to citizens and agencies known to be interested. c) Public meeting if controversy is known to exist.	Planning boundaries will be determined by completed 208 plan or state water pollution control agency. They must include source of pollution and an area large enough to analyze environmental impacts of treatment options.
2.	Criteria for state priority list.	a) Factsheet b) Public hearing (with 30 days' notice) c) Responsiveness summary submitted to EPA.	a) Do criteria relate to national and state water pollution goals? b) Are major pollution problems given priority? c) Are rural pollution problems being addressed? d) How are priorities established within "set asides." e) Are innovative and alternative systems given given high priority?	a) Active solicitation of public review and comment through direct mail. b) Several public meetings held before hearing. c) Circulation of Responsiveness Summary to hearing d) Summary of agency response to citizen input.	The 1977 Clean Water Amendments require states to develop new criteria. Citizens should ask their states to put them on the required mailing list that will ensure their receipt of factsheets describing changes in priority ranking and rating systems.

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* The public participation regulations on which this table is based are in the process of final approval at EPA before promulgation. These regulations are likely to be published in the Federal Register sometime in February. (See text for additional citation.)

	Decision Points	Public Participation Requirements	Issues to be Resoloved	Recommended Public Participation	Discussion
3.	State priority list.	a) Circulate statewide information about priority list (or any major revision thereto). b) 30-day advance notice before public hearing	a) Does list relate to established criteria? b) Are innovative solutions fully funded?	a) Fact sheets which indicate the nature of pollution problem and the scope of the proposed project. b) Direct mailings to groups and individuals known to be interested. c) Public notification of hearing thru press, media and mailings. d) Summary of agency responsiveness.	States are only required to give 30 days notice of hearing. Standard practice is to provide notification with project name, number and amount only. Citizens should pressure states to provide sufficent information to make hearings and comments meaningful.
4.	Preapplication Conference.	None.	a) Responsibilities of state and local governments. b) Time schedule. c) Explanation of process and requirements.	a) Establish a Citizens' Advisory Committee.	This conference takes place between EPA, state and grantee (local official), and consulting engineer, if hired. Funding application will commence after this conference.
5.	Selection of engineer.	None.	a) Does engineer have experience with innovative treatment systems? b) Has he included public participation in previously completed 201 projects? c) Does he have staff capability to undertake all phases of 201 planning?	a) If CAC is established, Advisory Committee interview with engineer candidates; or, if no CAC yet, establish an Engineer Selection Committee b) Distribute information about candidates and their previous experience.	The selection of a consulting engineer is a critical decision. It may determine the alternatives selected for study, the extent of the environmental assessment, and whether any public participation takes place. Some engineers may have experience with only one or two systems and be reluctant to consider others. Others will consider public input a nuisance rather than a help. EPA regulations encourage the grantee to consult with the public at this point.

Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
6. Plan of Study. (POS)	Notify and consult with public. Develop brief outline of public participation program.	a) Nature and scope of 201 plan. b) Schedule for completion of tasks. c) Itemized costs. d) Plan for public participation including staff, preliminary budget and schedule.	a) CAC, if established should review POS and make recommendations for public participation. b) Notify groups and individuals known to be interested. c) Responsiveness summary	The POS is not currently funded, so officials may be reluctant to establish any formal mechanism, but an effort should be made to see that at the very least some informal public input occurs, and that public participation activities are scheduled with sufficient funding. A responsiveness summary although not required may be useful at this point.
7. A-95 Review of POS	Clearinghouse comments	a) Consistency with existing regional and local plans. b) Is public participation adequately provided for?	a) Citizen should be invited to appear before A-95 committee to make recommendations if POS inadequate and/or write letter to clearinghouse for consideration prior to meeting date. b) Comments and recommendations of public forwarded to the EPA regional office. c) Citizens should contact the press regarding any request coverage of the issues.	The A-95 review is usual conducted by COG or Regional Planning Council. The POS may be considered by a sub-committee with geographic representation or only by a policy committee. The meetings are open to the public and usually time is provided for citizen comment if requested.
8. State review of POS.	Review adequacy of public participation outline in P.O.S.	a) Adequacy of planning area. b) Proper scope of tasks. c) Reasonable cost estimates.	a) Citizens should notify state agency of inadequacies in plan by letter or appointment if possible. b) Request a response indicating how your recommendations have been considered.	It is always best to meet personally with state and local officials if possible. Take along someone with technical expertise if your discussion will include topics of a technical nature.

Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
8. State review of POS cont'd.		d) Is the public participation work element in the plan adequate to ensure that public involvement policies and objecare met?	c) Ask that known interest groups, individuals and the press be notified of their decision and its basis.	Use the media to publicize the controversy only after you have determined differences cannot be resolved thru discussions and negotiations.
9. EPA review of POS (May principally be State Review in the case of of a delegated program)	a) Review adequacy of public participation work element in POS	a) Compliance with application requirements, 208 and basin plans and priority list.	a) Make known any objections to POS to EPA project officer.	If the POS has not been available for review, recommendations to each agency should always include information regarding issues, desirable public participation activities, alternative system, etc.
	b) Determine whether public participation program should be Basic or Full Scale.	b) Is public participation adequately provided for?	b) Include information regarding any special pollution, land use, growth or social or economic problems which have not been included in POS.	
	c) How will the Facilities Planning Process be coordinated with 208 planning?			
10. Award of Step I grant.	a) Hire public participation coordinator*	a) Did agency respond to issues received?	a) Contact consulting engineer to discuss scheduled planning.	Under current EPA require ments, any public participation work plan and funding allocation if it is to be considered must be a part of the POS. Proposed regulations would allow the grantee up to 45 days after the grant award to develop the plan. Even without the proposed regulations, if funding for a public participation program is inadequate or absent a grant amendment may be sought.
	b) Grantee informs public of opportunities to serve on Citizens Advisory Committee (CAC)*	b) Will a comprehensive public participation be implemented? Will a grant amendment be necessary to ensure an adequate public participation program?	b) Request that CAC be established if not done to date.	
	c) Establish CAC*		c) Discuss public participation program, how it will operate, staffing and budget, public participation specialist.	

* Required only in the Full-Scale Public Participation Program

	Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
10.	Award of Step I grant. cont'd.	d) Develop mailing list of interested and affected individuals. e) Establish staff contact for CAC (May be public participation coordinator) f) Within 45 days after award of Step I grant submit Public Paricicipation Work Plan (PPWP) to EPA g) Distribute to mailing list: 1) copy of PPWP 2) fact sheet on project h) Develop and Institute a public information program i) Establish informaation depository j) Train CAC members*	c) Have the appropriate issues for public involvement been identified? d) What kinds of information will facilitate public involvement?		
11.	Infiltration/ inflow Analysis	None	a) What parts of the system need rehabilitation because of groundwater leakage? b) Might rehabilitation take the place of new sewage treatment capacity?	a) CAC review and comment. b) Keep public aware of progress and results with regulat mailings of newsletters and informational materials.	This step only applies to projects with existint sewers.

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* Required only in the Full-Scale Public Participation Program

	Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
12.	Assess current situation.	a) Consult with public after 30 days notice b) Hold a public meeting* c) Prepare and distribute Responsiveness Summary (these requirements must take place no later than Decision #15)	a) To what degree will measures such as sewer system rehabilitation --water conservation and flow reduction programs--and better O&M of existing facilities obviate the need for new treatment plant capacity? b) Have current water quality problems, environmental conditions, population and land use data been properly assessed? c) Are there existing measurements on current wastewater flows? Are the sources of these flows known?	a) A public participation specialist should be hired to carry out public participation work plans. b) CAC should review and comment on assessment or individual consultations sought. c) Extensive mailing list of interested individuals and groups should be prepared by an engineer. d) Citizens task forces might be formed at a public meeting to assist in assessing 1) current and future situations 2) sensitive environmental and social concerns.	When a CAC is not established for development of the Facility Plan, other consultation methods should be pursued at each decision point, indicating CAC review or action.
13.	Environmental Assessment	(See #12)	a) Have all environmentally sensitive area within planning boundaries been adequately considered?	See recommended participation in steps 12, 13, 14, 15 and 16.	The Environmental assessment is an analysis of the current environmental situation and any changes likely to take place as a result of each of the major alternatives under consideration. It starts during the assessment of current situation, generally is conducted by

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* Required only in the Full-Scale public participation program

	Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
13.	Environmental Assessment cont'd.		b) Have the primary and secondary environmental impacts of all the major alternatives been adequately considered? c) Will a full scale environmental impact statement be necessary?		the consultant, and continues right up until the time of consultant recommendation. If the decision is made to expand the analysis to a full environmental impact statement, the information gathered in the assessment will be the basis for the EIS.
14.	Decision to "Piggy-back" an Environmental Impact Statement (EIS)	(See #12)	a) To what degree is there sufficient knowledge of environmental quality problems to decide to do the EIS concurrently with the environmental assessment?		If the environmental impacts are known to be significant early in the planning process, the EIS may be prepared in conjunction with the preparation of the plan. This is called "piggy-backing." If this occurs, a more extensive public participation program should be undertaken which focuses on the environmental impacts.
15.	Assess future situation.	(See #12) a) Mid-Project* Evaluation by EPA (or State) of compliance with public participation requirements.	a) Are land-use projections consistent with local planning and/or other community goals? Do existing land-use plans call for intrusion into environmentally sensitive areas such as floodplains or wetlands?	a) CAC reviews and makes recommendations. b) Workshop or public meetings to discuss issues. c) Fact sheets should be prepared and disseminated.	If a public participation specialist is not hired or the public participation elements contracted to a qualified firm or organization, it will be necessary for interested community groups to continually pressure for the opportunity for public input, particularly when major issues or controversies are involved.

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* Not required at this time necessarily, but at a "mid project" point.

	Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
15.	Assess future situation cont'd.		b) Are population projections consistent with BEA* projections or with significant new growth being planned for?	d) Interest newspaper in doing feature article.	
			c) Are planned future industrial flows adequately documented? Are they consistent with community plans?		
16.	Cost Effectiveness analysis	a) After 30 days notice, public meeting	a) Is the planning period reasonable?	a) CAC review of important decision points and recommendations on same.	Public scrutiny of alternatives prior to the engineers' preliminary selection of an alternative is very important. The cost effectiveness analysis weighs both monetary and nonmonetary factors in the various alternatives. Concerned citizens will wish to be involved in the value judgment implicit in that weighing process before decisions are made. If the alternatives can be agreed upon before the public hearing, the plan is more likely to be completed on time at the least expense.
		b) Responsiveness summary	b) Are the maximum number of alternatives being considered?	b) Public meetings and workshops, including CAC grantee and consultant participation.	
			c) To what degree are flow and waste level forecasts accurate? Does the facilities plan contemplate an aggressive Flow Reduction program?	c) Fact sheet and other information disseminated.	
			d) Has appropriate attention been paid to the phasing or staging of treatment works in order to provide for cost-effective treatment in a manner that helps control and manage growth.	d) On large projects public may need to be reached through neighborhood meetings, telephone committees.	

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* BEA - Bureau of Economic Affairs

	Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
16.	Cost Effectiveness analysis cont'd.		e) Which alternative has the least monetary cost and environmental cost and is most compatible with community goals? Will overriding environmental and social costs point to the selection of a particular alternative, even if that alternative has the higher monetary costs?	e) Encourage the use of speakers bureau, multimedia presentations, community options display at organizational meetings.	
			f) Are all the social and environmental costs considered in the cost effectiveness analysis?	f) Request that special task forces be set up if major issues need more concentrated scrutiny.	
17.	Sewer System Evaluation Survey Survey	None.	a) What are the needed corrective actions for sewer system rehabilitation, and what will be the specified cost?	a) Brief CAC on progress of evaluation.	This Evaluation is largely on the engineering study that will be conducted by the consultant. It may, nonetheless, involve substantial cost to the community, and the public should be kept apprised of results. This step only applies to projects with existing sewers.
			b) What parts of the system need rehabilitation because of groundwater and stormwater leakage?	b) Keep public aware of progress through mailings of newsletters and informational material.	
			c) Might rehabilitation take the place of new sewage treatment capacity?		
18.	Historical and Archeological investigations.	None.	a) Are historic or archeological sites affected by the alternatives chosen?	a) Submit recommendations if sites are known in the area.	These comments would best be presented before or at public hearing, if possible.
				b) CAC review and comment, if any sites determined to be in planning area.	

	Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
19.	Selection of Alternative	a) 30 days notice before public hearing. b) Final responsiveness summary with evaluation by grantee of effectiveness of public participation program.	a) Is the selected alternative the most cost-effective alternative to meet community needs? b) To what degree have the environmental social and economic impacts of the recommended alternatives been mitigated?	a) Request question/answer period before public hearing opens. b) Considering scheduling public hearing in evening or on weekend to ensure adequate public attendance. c) Request distribution of Responsiveness summary to all who attend hearing. d) Evaluation by Advisory Committee of Effectiveness of public participation program.	If there has been meaningful public involvement throughout the Facilities Planning process (including agency responsiveness to public concerns, much of the hearing testimony may focus on mitigating unavoidable impacts. In fact, if a comprehensive and well thought out public involvement program has taken place, the public hearing may surface no new issues, and may not be well attended.
20.	A-95 review of Facility Plan	Clearinghouse comment.	a) Is plan in accord with all areawide plans? b) Will the alternative selected eliminate the problem?	a) Request to be heard during review if plan is felt to be inadequate or public input has not been adequately considered.	The clearinghouse cannot approve or disapprove a plan, but rather gives favorable or unfavorable comments which are then considered by EPA. The comments can have a significant impact on whether a plan is approved, however.
21.	State review of Facility Plan.	(See #22 below)	a) Does plan comply with basin and 208 planning?	a) Present comments to state agency if in disagreement with selection of alternative. b) Ask state to notify public of certification or refusal of plan and the basis for its action.	

	Discussion Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
22.	EPA review of Facility Plan (May be principally state review in case of delegated program)	a) Evaluation of adequacy of public participation program. b) If public participation found inadequate recommended remedial actions.	a) Is the alternative cost effective? b) Have all requirements been met? c) Has adequate public participation occurred? d) Should an environmental impact statement be prepared?	a) Make known any comments or views not expressed in foreworded Facility Plan. b) Request agency notification of determination of plan.	If you are dissatisfied with any part of the Facilities Planning Process, this may be your last realistic opportunity for appeal. If substantial parts of the Facilities Planning Process have been delegated to a state agency, that agency will be your first avenue of appeal.
23.	Environmental Impact Statement	Public hearing.	a) Have all possible alternatives including "no action" received adequate consideration? b) Have environmental impacts of all options been adequately assessed? c) Can negative impacts of recommended alternatives be mitigated?	a) CAC involvement in weighing environmental factors and determining alternatives. b) Widespread dissemination of information. c) Workshop and meetings to discuss impacts, alternatives. d) Solicit widespread participation in hearings.	No Facility Plan may proceed until environmental issues have been satisfactorily resolved when an EIS is prepared by EPA.
24.	EPA Award of Step 2 grant.	a) Consultation with public regarding necessity of additional public participation. b) Public participation workplan if additional PP deemed necessary c) Inform public of financial impact of user charge system.	(Award contingent on Step 1 approval.) a) User charge system b) Industrial cost recovery (ICR) system.	a) CAC should continue to function as needed throughout Step 2. b) They should especially be involved in determining a user charge c) Information should be disseminated and a public hearing should be held if the costs are high or controversy arises.	An equitable user charge system must be included in the planning. In addition, industrial users must pay their share of construction costs directly attributable to control of their pollutant discharge. A proposal for these charge systems must accompany the Step 2 application. Detailed engineering plans and specifications will be developed during this stage.

	Decision Points	Public Participation Requirements	Issues to be Resolved	Recommended Public Participation	Discussion
24	EPA Award of Step 2 grant cont'd.	d) Consult with public prior to adoption of user charge and Industrial cost Recovery system.			
25.	Step 3 grant award.	None.	a) Any primary impacts of construction such as noise, soil erosion, air pollution, runoff.	a) CAC should continue to function as needed. b) Periodic information on progress, user charge/ICR ordinances, or implementation should be disseminated.	The construction phase may create controversy because of primary impacts on adjacent property or because some members of the public may not be aware of the project until construction starts. Implementation of user charge and ICR must be completed by the time 80% of construction is completed.

Table 10

MODEL

PLAN OF STUDY OUTLINE

BASIC PROGRAM (town of 10,000)

DECISION POINT	TECHNIQUE	SCHEDULE	STAFF SUPPORT	TARGET AUDIENCE
Grant Award				
Select Engineer	- Public notice	wk. 1	Grantee	
	- Identify public liaison on grantee/ consultant staff[2]	wk. 2	Grantee and/or consultant	
Information Program	- Public notice to media and mailing list of depository and materials available			
	- Identify key interests and develop project mailing list[2]			
	- Deposit key documents in town library[2]	wks. 6-7		
Public Participation workplan	- Develop detailed public participation workplan w/informal public input[3]	wks. 3-4	Consultant,	Key citizen leaders who express interest in participating
	- Develop and distribute public participartion workplan and first factsheet which identifies engineer and describes project[1]	wk. 5	Public liaison on grantee or consultant staff	Mailing List
Development of Plan				
Assessment of present and future situation	- Interview 208 PAC members[3]	mos. 2-6	Consultant	208 PAC members
	- Interview key local officials and citizens[3]		Consultant	Public health officer, town engineer, town planner, regional planners, conservation commission members, representative of local industry, chamber of commerce, etc.
	- Newspaper article in local paper			
	- Develop and distribute citizen survey[3]		Public liaison	Mailing list
	- Attend various local group meetings[3]		Consultant	PTA, JC's, Grange, LWV
	- Compile results of survey[3]		Public liaison	
	- Agency responsiveness summary[2]		Public liaison	Available to general public, prepared for EPA
Consideration of Alternatives	- Develop and distribute factsheets[3]	mos. 7-9	Public liaison	Mailing list
	- Notice of public meeting[2]		Public liaison	Mailing list
	- Public meeting[1]		Public liaison, consultant, grantee	General public
	- Prepare article for local newspaper [3]		Public liaison	General public
	- Agency responsiveness summary [2]		Public liaison	General public
Submission of Final Plan to town	- Distribute factsheet [3]	mo. 10	Public liaison	Mailing list
	- Notice of public hearing [2]		Public liaison	Mailing list
	- Public hearing [1]		Consultant, grantee	General public
	- Agency responsiveness summary [2]			
Town Approval State/ EPA Review and EIS Decision	- Final responsiveness summary [1]	mo. 11		

Note: [1] Required by proposed Part 35
[2] Required by proposed Part 25
[3] Meets a performance standard of Parts 25 and/or 35

Table 11

MODEL

PUBLIC PARTICIPATION WORKPLAN
BASIC PROGRAM (town of 10,000)

DECISION POINT	TECHNIQUE	SCHEDULE		TARGET AUDIENCE
1. Step 1 grant award	Hire public liaison Develop mailing list Develop Public Participation Workplan Distribute PPWP and Fact Sheet	wks. 1-6	Public liaison	General public
2. Assessment of present and future situation	Interview 208 PAC and/or CAC members [3] - their views on areawide and local water quality problems and key issues which should be addressed, population projections - their experience w/public participation key citizens who should be contacted	wks. 9-10	Consultant	Members of 208 PAC and CAC
	Interview key local officials and citizens [3] - identify major water quality problems/ issues - identify community goals and objectives	wks. 11-12	Consultant	Public health officer Town engineers, Planners Conservation Commission members Industrial dischargers Chamber of Commerce
	Publish article in local newspaper which: [3] - describes current situation and status of Facility Planning Process - summarizes attitude of town officials and key citizens on local water quality problems - highlights the importance of public input and describes scheduled public participation activities - identifies staff contacts	wk. 13	Public liaison	General public
	Develop and distribute citizen survey [3] Based on data collected during previous interviews, survey will seek to refine community goals, identify level of knowledge and preferences concerning water quality	wks. 13-14	Public liaison on consultant or grantee's staff	All registered voters
	Compile results of survey [3]	wks. 15-16	Public liaison	
	Attend various local group meetings[3] Get on the agenda of various civic groups' weekly/monthly meetings. Present overview of community water quality problems, answer questions, explain results of citizen survey, seek to further refine community goals and objectives	wks. 17-20	Consultant/public liaison	PTA, JC's, Grange, League of Women Voters, Sierra Club
	Prepare agency responsiveness summary [2] - summarizes results of citizen survey and other public consultation efforts. - outlines grantee's response to citizen input - placed on file at local libraries, Town Hall	wk. 22	Public liaison	EPA

Note: [1]Required by proposed Part 35
[2]Required by proposed Part 25
[3]Meets a performance standard of Parts 25 and/or 35

Table 11 cont'd.

DECISION POINT	TECHNIQUE	SCHEDULE	STAFF SUPPORT	TARGET AUDIENCE
3. Consideration of Alternatives	Develop factsheets which describe various alternatives being considered and outline the costs and environmental impacts of each [3]	wk. 26	Public liaison	Mailing list
	Distribute factsheets which also include notice of upcoming public meeting [2]	wk. 28	Public liaison	Mailing list
	Informal public meeting to discuss various alternatives, answer questions, identify options which may require further study [1]	wk. 32	Consultant, public liaison, grantee	General public
	Prepare local newspaper article which describes public meeting and decisions made [3]	wk. 33	Public liaison	General public
	Prepare agency responsiveness summary [2]	wk. 34	Public liaison	EPA
4. Submission of Final Plan to town	Distribute factsheet which highlights the major elements of the proposed plan and rationale for the selection [3]	wk. 40	Public liaison	Mailing list
	Notice of public hearing in local newspaper and sent to all on mailing list [2]	wk. 41	Public liaison	General public, mailing list
	Conduct public hearing to present final plan along with the draft EIS (if required) for their approval to community. Allow for additional citizen comments. If previous public participation efforts have been successful, however, no significant new issues should be raised at this time. [1]	wk. 46	Public liaison, consultant, grantee	General public
5. Town approval and submission to state and EPA	Public notice	wk. 47	Public liaison	General public
	Prepare final Responsiveness Summary[1] Place on file at local libraries, Town Hall	wk. 48	Public liaison	EPA

Note:
[1] Required by proposed Part 35
[2] Required by proposed Part 25
[3] Meets a performance standard of Parts 25 and/or 35

Table 12

BUDGET

BASIC PUBLIC PARTICIPATION PROGRAM

Salaries

Public Liaison

Consultant Staff

Secretary

Travel

$.15/mile - approx. 1,000 miles

Printing

Postage

Phone

TOTAL

Notes:

1. No actual dollar amounts are listed here as those amounts will vary depending upon a number of variables, such as:
   a. size of community and resulting mailing list, travel costs, etc.
   b. whether printed material is mimeographed, photocopied or printed; and
   c. whether community volunteer assistance is utilized (for example, the survey outlined in the Plan of Study could be distributed by local high school students).
2. The budget need deal only with those expenses directly attributable to public participation. The public participation and information responsibilities normally required of the consultant and the grantee need not be separately budgeted.
3. The Plan of Study Outline submitted prior to grant award contains a fair amount of detail on activities that take place during the first 45 days of the grant. After the first 45 days, a revised workplan will provide additional detail on the remainder of grant activities.

Table 13

MODEL

PLAN OF STUDY

FULL-SCALE PUBLIC PARTICIPATION

DECISION POINT	TECHNIQUE	SCHEDULE	STAFF SUPPORT	TARGET AUDIENCE
Award of Step 1 Grant				
1. Engineer selection	a) public notice b) informal meeting w/key interests	wk. 1	grantee	Range of community interest that will ultimately be on advisory committee environmental civic business labor
2. Initiate preliminary stages of public participation plan of study (work element of)	a) grantee hire public participation coordinator	wk. 2	grantee	Volunteer community leader w/organizational skills and knowledge of water quality
	b) consulting firm designates public liaison[2]	wk. 2	consultant	
	c) begin to develop mailing list[2]	wks. 1-3	grantee	All those private and public interests with a potential interest in the Facility Plan. Some of the list will be obtained from the 208 agency.
	d) deposit key documents in town library			
	e) public notice regarding availability of documents	wks. 1-3	grantee	Mailing list media
	f) establish citizen advisory committee[1] 1) notice to mailing list and media of opportunity to become member[2] 2) notice to mailing list and media of finally selected members.[3]	wk. 3	public part. coor. grantee	Members of local organizations such as: League of Women Voters Chamber of Commerce Sierra Club Tax Payers Association Local Union Minority Group Mailing list Newspapers
	g) public notice w/factsheet of first CAC meeting to review public participation workplan. Factsheet will describe project. Notice will include list of advisory committee and engineer.[3]	wk. 3		
	h) train advisory committee members and grantee in one-day workshop. Purpose will be to briefly review town's water quality problems, need for action, role of CAC, types of conflicts and tradeoffs likely. Establish goals of CAC. Workshop run by grantee and consulting engineer.[2]	wk. 6	public part. coor. grantee	CAC members, engineer, town officials, state officials
3. Review public participation work element. Develop public participation workplan	a) Public CAC meeting to review public participation workplan[3]	wk. 5	Grantee, public part. coor.	Broad range of community interests, CAC, consulting engineer, grantee representative
	b) Revised public participation workplan sent to EPA[1]	wks. 6-7	public part. coor.	

Note: [1] Required by proposed Part 35

Table 13 cont'd.

DECISION POINT	TECHNIQUE	SCHEDULE	STAFF SUPPORT	TARGET AUDIENCE
Development of Facility Plan				
1. Assess current situation	a) begin monthly newsletter[3]	mos. 2-4	public participation coordinator	General public
	b) informal consultation/interviews[3]		public participation coordinator, consultant's public liaison	Key officials, selected citizen leaders and special interests
	c) joint 201-208 staff and CAC meeting[3]		public participation coordinator, grantee rep., consultant staff and public liaison	201-208 staff and key advisory committees
2. Assess future situation	a) field trip[3]	mos. 3-6	public part. coor.	General public
	b) speakers bureau[3]		CAC, consulting engineer, grantee rep.	General public
	c) series of workshops on special issues[3] 1) Sensitive Environmental Areas 2) Residential and Industrial Growth		public part. coor., consultant, public liaison	Public and civic interest group
	d) public meeting[1]		CAC, public part. coor., consultant liaison, grantee rep.	General public and special interests
	e) agency responsiveness summary[1]		public part. coor.	EPA, state participants in meeting
3. Consideration of alternatives Cost-Effectiveness analysis	a) factsheet on alternatives[2]		public part. coor	General public
	b) speakers bureau continues[3]		as previously described	
	c) CAC mid-study briefing[3]		consulting engineer staff	CAC, grantee, public groups
	d) public meeting[1]			General public
	e) agency responsiveness summary[1]		public part. coor.	EPA, participants in meeting
4. Engineer's Recommendation on Preferred Alternative	a) public hearing notice[2]	mos. 7-8	public part. coor.	General public
	b) prepare and mail factsheet 30 days[2] days in advance		public part. coor.	Mailing list, civic organizations, local government
	c) hearing on recommended alternative and EIS [1]		grantee, public part. coor.	General public
5. Town Approval	a) agency responsiveness summary distributed to hearing participants [2]	mo. 9	public part. coor.	EPA, state, hearing participants
	b) final responsiveness study submitted to EPA with Facility Plan [1]			
	c) public notice of final decision [3]			
6. Application for Step 2 Grant	a) CAC meeting to develop public participation plan for Step 2 and 3		public part. coor.	CAC members, grantee rep.

Note: Required by proposed Part 35
Required by proposed Part 25
Meets a performance standard of Parts 25 and/or 35

Table 14

MODEL

PUBLIC PARTICIPATION WORKPLAN
FULL-SCALE PUBLIC PARTICIPATION

DECISION POINT Development of Facility Plan	TECHNIQUE	SCHEDULE	STAFF SUPPORT	TARGET AUDIENCE
1. Assess current Situation		mos. 2-4		
	a) "Clean Water News", Vol. 1[3] monthly newsletter to be mailed throughout the Step 1 process. The first newsletter will: - describe what is known concerning the current situation - describe additional information being sought by consultant - outline the project schedule including public participation activities - identify staff contacts and CAC members - solicit comments and feedback from public with brief tear out questionnaire	wk. 8	public part. coor.	All interested persons from the region CAC, consulting engineer grantee representative Use 208 mailing list
	b) consultations with key publics i. informal interviews w/selected individuals w/knowledge of community situation [3]	wks. 8-12	public part. coor. consultant, public liaison	Public health officer Town engineers Industrial dischargers Conservation Commission members Other knowledgeable citizen leaders
	ii. CAC meeting. This will be an open meeting announced in Vol. I of the newsletter and will center around the key questions that should be asked during the assessment of the current situation.[3]	wk. 10	public part. coor.	Citizens Advisory Committee and interested members of general public
	iii. Joint meeting with some 208-201 staff and 208-201 CAC to discuss implications of 208 plan for 201 study. Appoint permanent staff and CAC liaison[3]	wk. 11	public part. coor. grantee rep. consultant staff and public liaison	Engineers, grantee representative, key CAC members
	c) "Clean Water News", Vol. 2[3] - summarize preliminary findings of assessment - identify key areas of social/economic/environmental conflict to be affected by Facilities Plan - notice of field trip to problem areas	wk. 12	public part. coor.	General public

Note:
[1] Required by proposed part 35
[2] Required by proposed part 25
[3] Meets a performance standard of Parts 25 and/or 35

Table 14 cont'd.

DECISION POINT	TECHNIQUE	SCHEDULE	STAFF SUPPORT	TARGET AUDIENCE
2. Assess future situation		mos. 3-6		
	a) field trip focusing on areas of future conflict[3]	wk. 16	public part. coor.	CAC, grantee, consultant general public
	b) Speaker's Bureau: public coordinator's office and CAC speak at numerous scheduled civic meetings regarding the issues involved in the facilities planning process [3]	wks. 12-24	public part. coor., grantee rep., consultant liaison, CAC	General public, civic groups, i.e., PTA, Rotary, garden clubs, environmental groups, round table, etc.
	c) send out notice of public meeting with factsheet [2]	wk. 14	public part. coor.	Mailing list, general public, CAC
	d) "Clean Water News", Vol. 3 [3] - key issues in future assessment study - what existing land-use plans and populations projections mean for Facility Plan - what does the 208 plan say about the future? - preliminary ideitification of treatment alternatives - notice of public meeting	wk. 16	public part. coor.	
	e) series of special interest workshops to discuss key issues and alternatives[3]	wks. 14-16	public part. coor., grantee rep., consultant liaison	Civic groups
	f) public meeting with CAC[1] - establish working Task Forces as subcommittees of CAC to work w/consulting engineer in resolving critical issues and in monitoring the engineer's analysis of treatment alternatives	wk. 19	public part. coor., grantee rep., consultant liaison	General public, special interests
	g) agency responsiveness summary [1]	wk. 20	public part. coor.	EPA, state
	h) Clean Water News, Vol. 4 [3] - summarize results of public meeting - describe agency responsiveness summary	wk. 20	public part. coor.	
3. Consideration of Alternatives Cost-Effectiveness Analysis		mos. 6-9		
	a) Clean Water News, Vol. 5, [3] This newsletter would include a factsheet presentation on the major alternatives being considered. The factsheet will describe: - major environmental social and economic impacts and implications for community development	wk. 24	public part. coor. public part. coor.	General public General public
	b) public meeting notice [2]	wk. 26	public part. coor., grantee rep., consultant liaison, CAC	
	c) speakers bureau continues. focus on alternatives [3]			
	d) CAC and Task Force meet with consulting engineer for mid-study briefing on alternatives [3]	wk. 28	consulting engineer, public part. coor.	
	e) public meeting to solicit comments an questions on alternatives, and to present preliminary EIS study [1]	wk. 31	public part. coor., grantee, consultant	General public, CAC, grantee
	f) agency responsiveness summary [1]			EPA

Table 14 cont'd.

DECISION POINT	TECHNIQUE	SCHEDULE	STAFF SUPPORT	TARGET AUDIENCE
4. Engineer submits recommendation of preferred alternative to town officials (mo. 11)	a) notice of public hearing received 30 days in advance[2]	wk. 41	public part. coor.	Newspapers, mailing list general public
	b) factsheet summarizing final recommendations and notifying of upcoming hearing [2]	wk. 41	public part. coor.	General public, mailing list
	c) public hearing (possibly town meeting) on recommendations and draft EIS [1]	wk. 46	grantee	
5. Town approval of Facility Plan and submission to State and EPA		mo. 12		
	a) notify public[3]	wk. 46		General public
	- prepare agency final Responsiveness Summary[1]	wk. 47-48	public part. coor.	EPA State agency
	- place on file at easily accessible locations around town (public library, town hall), mail copies of agency responsiveness summary to hearing participants		public part. coor.	General public
6. Application for Step 2 Grant	a) consultation with CAC to determine future role and develop public participation program for Steps 2 and 3 [3] b) public notice and factsheet			CAC

Table 15

BUDGET

FULL-SCALE PUBLIC PARTICIPATION PROGRAM

Salaries

- Public Participation Coordinator
- Assistanc Public Participation Coordinator
- Secretary
- Consultant Liaison

Advisory Committee Budget

- Travel
- Clerical Support
- Technical assistance

Staff Travel

Printing

Postage

Phone

TOTAL

Notes:

1. No actual dollar amounts are listed here as those amounts will vary depending upon a number of variable, such as:
    a. size of community and resulting mailing list, travel costs, etc.
    b. whether printed material is mimeographed, photocopied or printed; and
    c. whether community volunteer assistance is utilized (for example, the survey outlined in the Plan of Study could be distributed by local high school students).
2. The budget need deal only with those expenses directly arrtibutable to public participation. The public participation and information responsibilities normally required fo the consultant and the grantee need not be separately budgeted.

Table 15 cont'd.

3. The Plan of Study Outline submitted prior to grant award contains a fair amount of detail on activities that take place during the first 45 days of the grant. After the first 45 days, a revised workplan will provide additional detail on the remainder of the grant activities.

4. The cost of the public participation coordinator will vary depending upon the institutional attachments and background of that coordinator. For example, the coordinator could be:

   a. on the consulting engineer's staff;

   b. on the grantee's staff;

   c. a representative of a public interest group; or

   d. a private citizen with background and experience in public participation programs.

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CHAPTER VII

MITIGATING PRIMARY AND SECONDARY IMPACTS OF WASTEWATER TREATMENT FACILITIES

The construction of a sewage treatment facility is most often associated with two types of impacts--primary and secondary--which can be both positive and negative. While some negative impacts are inevitable, most can be avoided or mitigated if recognized early enough in the facilities planning process. In fact, federal law requires that negative impacts be identified and all reasonable steps be taken to limit their consequences. Some of the ways to mitigate negative impacts are explored in this chapter, using case studies where possible to illustrate various approaches.

What Are Primary and Secondary Impacts?

Primary and secondary impacts are defined and discussed in Chapter II. To review briefly, primary impacts are relatively easy to identify as those that can be attributed directly to the proposed action. They include: environmental impacts resulting from construction and operation of the facility, (erosion, sedimentation, noise); economic impacts associated with construction and operation (capitalization, O&M costs, user charges, etc.); and social impacts such as traffic disruption during construction or decline in property value of land near the plant.

Secondary impacts are those resulting from indirect or induced changes in community land-use patterns, population or economic growth and subsequent environmental effects of those changes. They are often long term and difficult to identify. While primary impacts are diretly related to the construction process and specific construction activities, secondary impacts result from the placement, sizing or staging of interceptor sewers and the provision of reserve capacity in those sewers. Secondary impacts might include:

A. Changes in the timing, density, type and location of residential, commercial and industrial development, or changes in the use of open space or other categories of land. The provision of public sewage capacity is known to encourage growth, particularly in areas where sewage treatment would otherwise not be feasible.

This chapter was written by Marissa Roche.

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The cumulative results of these impacts may or may not adversely affect the environment.

B. Changes in air, water, noise, solid waste or pesticides pollution stemming from the induced changes in population and land use. Induced changes potentially could aggravate the water pollution problem which the treatment facility was designed to remedy, or could create new pollution problems from effluent disposal or nonpoint sources of pollution.

C. Damage to sensitive ecosystems (wetlands, habitats of endangered species) or culturally important areas (parks, historic sites) resulting from changes in population densities and land use.1/

Why Should Primary and Secondary Impacts be Considered?

Consideration of primary and secondary impacts and mitigating measures is required by federal law during planning and construction of sewage treatment facilities. Specifically, the 1977 Clean Water Act Amendments [Sec. 511(c)(1)] make clear that National Environmental Policy Act (NEPA) requirements for Environmental Impact Statements (as well a all other NEPA requirements) apply to the Construction Grants Program.

This means that in situations where EPA determines that the potential impacts of a proposed sewage treatment facility will be "significant and adverse," EPA must conduct an Environmental Impact Statement (EIS). The EIS must include not only a discussion of all the potential primary and secondary impacts (positive and negative), but also must identify "protective and mitigative measures to be taken . . . to reduce or compensate for any environmentally detrimental aspect of the proposed action." (40 CFR 6.304).

Other federal environmental laws (i.e., Clean Air Act, Endangered Species Act) also apply to the EPA Construction Grants Program (they are listed in Chapter I). These laws require EPA to ensure that proper steps are taken to mitigate adverse impacts on specific natural and cultural resources such as floodplains, aquifers and water recharge areas, and archeologic or historic sites. EPA has developed regulations and guidance to help its own staff and its grantees to comply with the requirements of these other laws (40 CFR Parts 6, 30, 35, Program Requirements Memoranda 75-26, 75-27, 75-31, 76-4, 76-5).

How Is the Appropriate Mitigation Measure Selected?

There are usually several measures available to mitigate a particular primary or secondary impact. Yet, since community situations differ, the effectiveness of particular mitigating measures will also vary. It is important to select the measure that best meets the particular needs of the community involved.

Several key questions should be considered when selecting the appropriate mitigation methods:

1) What range of possible mitigation measures is available?

2) How feasibly can these measures be adopted? (Can existing laws be applied or must new ones be developed? What are the costs of implementing mitigating measures, and who will pay?)

3) Who will be responsible for implementing the measure? (construction contractor, local government, EPA)

4) What authority and enforcement capabilities exist?

These questions will be addressed in the following pages.

1) What Mitigating Techniques Are Available?

Primary impacts. Primary impacts such as noise, odor, erosion and sedimentation are generally short-lived and/or relatively easy to identify and mitigate. The many mitigation options generally coincide with the three stages of project development; site selection and design, plant construction and plant operation.

The first step in mitigating primary impacts involves careful site selection and design based on a detailed survey of such factors as site topography and geology, compact site planning, odor and aerosol sources, noise sources and maintenance and access requirements. There are three basic strategies for environmentally sound site planning and design:

a) Advantageous use of positive site features (i.e., prevailing winds or seasonal solar angles, vegetation that can serve as a natural screen or buffer).

b) Design of necessary facility elements to avoid or minimize environmental compatibility problems (i.e., extend outfall pipe to a water depth that will preclude easy accessibility and enhance diffusion of effluent).

c) Addition of special design elements not necessary for plant function but rather to solve environmental compatibility problems (e.g., construction of esplanade along river bank adjacent to facility to enhance recreational access to river.2/

One or a combination of these strategies may be employed in any facility design.

The second step involves careful control over construction activities. Many methods are available to minimize construction impacts, including:

- careful timing of construction activities (to coincide with stream low-flow periods, thus minimizing turbidity or sedimentation impacts; or to avoid the nesting period of certain indigenous animal populations)
- immediately restoring and revegatating disturbed areas to minimize erosion
- using electric motors to minimize noise
- using an archeological consultant to ensure that archeological resources are recovered or left undisturbed
- periodically wetting down unpaved surfaces to minimize dust
- continually cleaning up general site debris and screening construction activities as much as possible to minimize esthetic impacts.

A third step in minimizing primary impacts concerns actual operation of the treatment facility. In this case, mitigating measures include such provisions as:

- adoption of odor and noise control measures within the plant
- adequate treatment and disposal of sludge to minimize odor
- design of emergency backup system to mitigate damages resulting from malfunction
- monitoring equipment to evaluate impact of discharge on receiving waters
- construction of permanent erosion control structures
- adoption of specific erosion and sediment control measures as standard O&M procedures[3]

Secondary impacts. Secondary impacts specifically linked to the construction of sewage treatment and collection facilities are usually long-term consequences that are difficult to predict. In fact, to distinguish community changes caused by construction of a particular facility from changes that would have occurred naturally often involves more soothsaying ability than technical skills. Also, because efforts to control secondary impacts have been initiated only in recent years, little documented experience is yet available to indicate how effective any proposed mitigation measure can be in the long run.

According to present policy, the community served by the planned facility has the primary responsibility for identifying secondary impacts and developing appropriate mitigating measures. EPA has compiled a list of such measures. It includes:

- Phasing and orderly extension of sewer service. Rather than initially extending sewers to presently undeveloped areas, potentially encouraging rapid growth and sprawl, sewer extensions might be phased in over several years and/or restricted to areas of greatest need.

- Project changes. The reserve capacity of the facility might be reduced based on revised population projections, or the project design might be changed from a single regional system with interceptors to several smaller systems servicing only existing growth areas.

- Improved land-use planning. Communities might develop or improve land-use plans to identify areas suitable for development as well as those which are environmentally sensitive. Plans should be accompanied by appropriate land-use regulations (zoning, subdivision ordinances) and fiscal planning for extension of public services which ensure that new development wll be compatible with the plan.

- Better coordination of planning among communities affected by the project. It is important that all communities affected by a project coordinate their land-use planning efforts. Secondary impacts of a sewage treatment facility are seldom limited to the boundaries of the community within which it exists. Sensitive environmental areas, for example, even if under the jurisdiction of several communities, should be protected from growth by compatible land-use restrictions.

- Sewer use restrictions. The number and type of sewer hook-ups can be restricted. For example, if the final decision necessarily involves interceptor sewers that traverse an environmentally sensitive area, the number of new sewer hook-ups permitted from those areas can be carefully limited.

- Modification or adoption of environmental programs or plans. In urbanized areas, increased air pollution resulting from induced population growth may be one of the most significant secondary impacts of a new sewage treatment facility. States are already required by the Clean Air Act to develop Air Quality Maintenance Plans, and many are already involved in the process. Strategies identified in existing Air Quality Maintenance Plans (improved mass transportation, automobile disincentive programs) which apply to a particular facilities planning area should be adopted or modified according to the projected impacts of the new facility.

- Improved land management controls to protect water quality. Ideally, a good Section 208 water quality management program (see Chapter I) should include the necessary land management controls to protect future water quality in a given facilities planning area. However, in areas where the 208 plans have not been implemented or are not considered adequate, measures such as state or local erosion control and sedimentation programs and flood plain and coastal zone management programs may exist or can be adopted to ensure that the water quality impacts of new development, induced by the sewage treatment facility, will be minimized.

2) How Feasibly Can These Measures be Implemented?

Once the range of possibilities has been considered, it is important to consider how feasible it is to implement a particular mitigation measure. In many cases, primary impacts can be handled routinely by the facility designer or construction contractor through careful site design or environmentally sound construction practices. EPA has outlined general engineering principles and specific minimum engineering efforts that must be incorporated in the Step 1 Facilities Plan. (Program Requirements Memorandum, PRM, No. 78-1, "Erosion and Sediment Control in the Construction Grants Program"). These requirements should ensure that at least the major primary impacts (soil erosion and sedimentation) of plant construction are minimized.

Secondary impacts, on the other hand, often can be mitigated only by enforcement of land-use regulations or management practices. It is therefore important for a community to assess the political feasibility of adopting or modifying land-use controls. In situations where state or local land-use controls such as floodplain ordinances, air quality maintenance plans, Section 208 water quality management plans or comprehensive growth management plans are in effect, it may be relatively easy to control secondary impacts simply by enforcing existing plans and ordinances. In situations where adequate land-use controls do not exist (which is more often the case), a community may be required to adopt necessary measures to successfully mitigate secondary impacts. If communities involved in a Step 1 planning project are unresponsive to the idea of land-use controls or are more concerned with stimulating economic development than maintaining environmental quality, mitigation of secondary impacts can be difficult to achieve.

Existing local land-use plans may not be an adequate basis for proposed mitigation measures. Plans should be reviewed carefully to determine how effective they will be in regulating future development and thus minimizing secondary impacts. Some land-use plans simply are too general to provide adequate protection; others may be based on exclusionary zoning practices that could at some point be challenged in court. Relying on mitigating measures based on these kinds of inadequate land use plans may prove to be folly. Instead the community might consider adopting one of the alternative measures discussed here.

Timing is a key element for successful implementation of mitigation measures. Impacts should be identified very early in the planning process and a range of mitigation techniques should be considered. For obvious reasons, once the Facilities Plan is completed and construction is underway, it may be extremely difficult and costly to make design changes.

A chart of the stages involved in the development of a wastewater facility (Table 16) outlines where in the planning process key decisions are made. From the moment the state places a project on its Priority List right through to the point where the plan is actually in operation, there are opportunities for concerned citizens to raise the issue of primary and secondary impacts. However, as the project moves from the planning to the design and then to the construction phase, the opportunities to introduce mitigating measures are greatly reduced.

Another consideration that affects feasibility is the cost to the community of implementing a particular measure. Some mitigating measures, such as reduction in facility size or service area, may actually bring down project costs. Others may increase the total cost slightly or have no cost effect at all (for example, siting the facility to exploit prevailing winds as a natural odor control or using existing trees on site as a natural screening device.) Or, if the additional costs for a particular mitigating measure are significant (i.e., costs for extending outfall an extra 100 yards), they may be considered a grant-eligible item; hence, the community share of these costs would be minimized.

However, some mitigating measures may require community expenditures that are not considered grant-eligible. Take for example the situation where a community is considering construction of an interceptor sewer across a wetlands area because it is less expensive than other alternatives, which all involve pumping the sewage uphill. To discourage future development on these wetlands, the community might consider purchasing them (particularly if a sewer use restriction is considered to be illegal). However, the costs of acquiring those wetlands would not be covered by the construction

Table 16

TYPICAL STAGES OF DEVELOPMENT IN A MUNICIPAL WASTEWATER TREATMENT FACILITIES PROJECT

Preapplication Stage	Facilities Planning Stage	Design Stage	Construction Stage	Operation and Maintenance Stage
o State places project on priority list. o Applicant selects consultant. o Applicant and consultant have preapplication conference with State and EPA. o Applicant prepares plan of study and submits to A-95 Review Process.	o Application for Step I grant submitted to State and EPA including the plan of study for review and approval. o Consultant prepares facilities plan including an environmental assessment. o Facilities plan is submitted to A-95 Review. o Consultant conducts public hearing on the facilities plan. o EPA and State review and approve facilities plan. o EPA prepares environmental impact statement, if necessary, or declares none is needed in a negative declaration and environmental appraisal. o Public hearing is conducted as part of EIS process when required.	o Consultant prepares and submits application for Step II grant to State and EPA for approval. o EPA may condition Step II grant on mitigating secondary impacts. o Consultant prepares and sumbits plans and specifications. o EPA and State reviews and approves project plans and specification o In projects where there is no Step I, NEPA requirements would still have to be performed prior to awarding the Step II or Step III grant.	o Consultant prepares and submits application for Step III grant to State and EPA for approval. o EPA may condition Step III grant on mitigating secondary impacts o Grantee advertises for construction bids selects responsive low bidder, submits all bids in tabular form to State and EPA for approval, and upon approval awards contracts. o Project is constructed. o EPA and State conducts final inspection. o EPA conducts final audit and makes payment.	o Plant operated and maintained for life of project. o State and EPA make operation maintenance and permit compliance inspections. o Municipality collects sewer service charges and promulgates sewer use regulations.

Source: "Mitigating Secondary Impacts from the Wastewater Facilities Program An EPA case studies series," EPA Office of Land Use Coordination.(unpublished) grant, meaning the community share of total project costs might be very high.

On the other hand, the community might decide to mitigate potential growth impacts on the wetlands by relocating the interceptor sewer outside the environmentally sensitive area. (This action would require changes in the project design.) If such an alternative is a "cost-effective" solution, then the federal government, not the local community, would absorb the greatest share of the additional costs.

3) Who Has Responsibility For Implementation?

An equally important consideration is who will have ultimate responsibility for implementing mitigation measures. In most situations, quite a few government agencies, organizations and individuals may be involved, and it is therefore important that their respective roles be identified and that the wastewater management agency have the capacity to coordinate their efforts to make sure the job gets done successfully.

For example, the construction contractor may be the logical one to implement environmentally sound construction practices to minimize the primary impacts of construction. But the wastewater management agency would be the one to implement specific measures required to mitigate impacts of operation, and the local government generally will have responsibility for implementing land-use controls. A list of impact mitigation measures (Table 17) prepared as part of the draft Environmental Impact Statement for the North Monterey County Facilities Plan illustrates the range of possible implementing entities to be considered. (The North Monterey Facility Plan called for a secondary treatment and discharge facility with an option to use some or all of the treated effluent for irrigation.)

4) What Authority and Capabilities Are Available To Ensure Implementation?

The Step 1 plan must demonstrate, among other things, that the authorities which will implement the plan have the necessary legal, financial, institutional and managerial authority and resources to carry out construction, operation and maintenance. In terms of mitigating primary and secondary impacts, then, the plan must show that the authorities identified to implement specific mitigation measures have the necessary qualifications to do so.

TABLE 17

SUMMARY - IMPACT MITIGATION MEASURES

Mitigation	Possible Implementing Entity(ies)*
CONSTRUCTION IMPACTS	
o Source control of noise, air emissions, dust.	Construction contractor
o Avoid, minimize removal of vegetation; keep disturbed area as small as possible, reseed.	Construction contractor
o Reroute, control flow of traffic.	Construction contractor
o Avoid construction through critical wildlife habitat, scenic areas, agricultural land.	MPWPCA
OPERATION IMPACTS	
Soils-Agriculture	
o Utilize highest level of wastewater treatment possible, implement source controls.	MPWPCA
o Practice deep soil tillage	Local farmers
o Increase water applications to *leach* salts.	Local farmers
o Blend water sources.	Local farmers
o Irrigate only at night	MCFCWCD, CID, local farmers
Water Quality	
o Increase irrigation efficiency to reduce agricultural runoff.	Local farmers
o Pretreat agricultural runoff before discharge	Local farmers, RWQCB
o Utilize highest level of wastewater treatment possible, implement source controls.	MPWPCA
o Install tile underdrains in wastewater irrigation areas.	Local farmers
o Dewater *sludge* prior to landfilling.	MPWPCA
Public Health	
o Avoid wastewater irrigation in the vicinity of domestic wells.	MCEHD, local farmers
o Line all wastewater storage ponds with impermeable materials.	MPWPCA
o Install tile underdrains in wastewater irrigation areas.	Local farmers
o Follow wastewater irrigation guidelines of State Department of Health, Title 22 of California Administrative Code.	MCEHD, CDH
o Utilize highest level of wastewater treatment and *disinfection* possible.	MPWPCA
o Implement vector control program at reservoirs through local mosquito abatement districts.	MPWPCA, NSVMAD
Resources	
o Utilize those treatment processes with lowest chemical and energy requirements.	MPWPCA
o Select pipeline routes, treatment plant location with least pumping requirements.	MPWPCA
o Utilize digestor, landfill-generated methane for treatment plant energy source.	MPWPCA
Wildlife, Vegetation	
o Maintain summer flow in the lower Salinas River by:	
1. Pumping groundwater near Salinas.	MPWPCA, City of Salinas
2. Pumping regional plant effluent upstream for discharge.	MPWPCA
3. Retain Salinas plant wastewater discharge to river.	City of Salinas, MPWPCA

ARB	California Air Resources Board
CDH	California Department of Health
CID	Castroville Irrigation District
DFG	California Department of Fish and Game
EPA	U. S. Environmental Protection Agency
MBUAPCD	Monterey Bay Unified Air Pollution Control District
MCBS	Monterey County Board of Supervisors
MCEHD	Monterey County Environmental Health Department

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TABLE 17 cont'd.

Mitigation	Possible Implementing Entity(ies)*
4. Additional upstream water releases.	MPWPCA, MCFCWCD
o Use of treated wastewater for habitat enhancement on Department of Fish and Game wildlife area.	DFG, CDH, MCEHD
o Utilize highest level of wastewater treatment possible, implement source controls.	MPWPCA
Economics	
o Implement least costly treatment and disposal alternative possible.	MPWPCA
o Limit treatment facilities sizing to that level considered grant fundable by EPC and SWRCB.	MPWPCA
o Eliminate as much infiltration/inflow as possible.	MPWPCA, local public works departments
o Initiate water conservation and wastewater flow reduction programs.	MPWPCA, SWRCB, RWQCB, local government, public at large
GROWTH-RELATED IMPACTS	
General - Land, Water, Wildlife, Vegetation Resources	
o Size wastewater treatment facilities for existing service area population only.	MPWPCA
o Encourage high density development in newly urbanized areas.	Local planning agencies, city councils, MCBS
o Encourage infill rather than peripheral development or sprawl.	Local planning agencies, city councils, MCBS
o Utilize Williamson Act land protection.	Local planning agencies, city councils, MCBS, local landowners
o Implement a wastewater reclamation alternative to augment local water supplies.	MPWPCA
o Modify general plans and zoning ordinances to protect recognized valuable resources, i.e., rare and endangered plants, wildlife, unique vegetation.	Local planning agencies, city councils, MCBS
Air Quality	
o Adopt more stringent vehicle emission standards.	EPA, ARB
o Adopt more stringent point source emission standards.	MBUAPCD
o Control development of new industrial sources of pollution through general plan and zoning amendments, changes in conditional use permit procedures.	Local planning agencies, city councils, MCBS
o Reduce overall vehicle travel by:	
1. Modifying general plans and zoning ordinances to encourage infill and reduce urban sprawl.	Local planning agencies, city councils, MCBS
2. Design new residential areas to facilitate bus service.	Local planning agencies, MPT
3. Improve local transit service, encourage carpooling.	Local government MPT
4. Encourage new development planning that facilitates non-motorized travel.	Local planning agencies
o Invoke temporary treatment plant flow limitations until alternate mitigations are devised.	EPA, SWRCB

MCFCWCD	Monterey County Flood Control and Water Conservation District
MPT	Monterey Peninsula Transit
MPWPCA	Monterey Peninsula Water Pollution Control Agency
NSVMAD	Northern Salinas Valley Mosquito Abatement District
RWQCB	Central Coastal Regional Water Quality Control Board
SWRCB	California State Water Resources Control Board

Reproduced from best available copy.

In situations where a single community is the wastewater grant applicant, it may be relatively easy to demonstrate that the necessary powers and resources do, or will soon, exist to implement mitigation measures. The applicant may, for example, simply describe existing land-use regulations that will be applied or indicate its intentions to institute necessary growth management practices.

With regional facilities, however, the grant applicant often may be a single community applying on behalf of several others in the system. In this case, the applicant probably would not have the authority to implement mitigation measures outside its own political jurisdiction. Or, the applicant might be an interjurisdictional authority (special district) created for the express purpose of handling wastewater management problems for a particular area. Such an entity generally is granted very specific and often limited powers to carry out its single purpose mission. As a result, most of the measures available to mitigate impacts (particularly secondary impacts) would be beyond its authority to implement.

A grant applicant that represents such an interjurisdictional authority may be required in its Step 1 plan to demonstrate that appropriate mitigation measures will be implemented by securing written agreements from each of the participating jurisdictions, confirming their commitment and capability to carry out the proposed measures. Negotiating such jurisdictional agreements can often be difficult.

What Is EPA's Role?

EPA has the ultimate responsibility and authority to make sure appropriate mitigation measures are implemented. No design or construction grant will be issued unless EPA is satisfied that the proposed Facilities Plan has addressed any and all controversial environmental issues. In effect, by controlling the purse strings, EPA offers a very attractive carrot that could ultimately influence land-use decisions in communities across the country.

EPA has developed a series of regulations and guidelines to amplify the agency's policy on mitigating secondary impacts of sewage treatment facilities. One, for example, states that when:

> . . . secondary effects of a project can reasonably be anticipated to contravene an environmental law or regulation, or a plan or standard required by an environmental law

> or regulation, the Regional Administrator shall withhold approval of Step 2 or Step 3 construction grants until the applicant revises the plan, initiates steps to mitigate the adverse effects or agrees to conditions in the grant document requiring actions to minimize the effects.5/

Another, acknowledging the importance of wetlands and the need to protect them from the impacts of construction grants programs, states that:

> . . . it shall be the policy of this Agency not to grant Federal funds for the construction of municipal wastewater treatment facilities or other waste treatment associated appurtenances which may interfere with the existing wetland ecosystems, except where no other alternative of lesser environmental damage is found to be feasible.6/

The EPA Regional Office has the responsibility for ensuring that potential primary and secondary impacts are considered from the very beginning of the facilities planning process. (The attitude of the Regional Office toward minimizing environmental impacts will determine how seriously mitigating measures are considered.) During the preapplication conference, which precedes issuance of a Step 1 grant, EPA staff should raise the issue of potential impacts with the applicant and his consultant and indicate what range of mitigation measures are available. If the potential impacts appear to be significant, EPA may require that a full EIS (rather than an Environmental Impact Assessment) be prepared to accompany the Step 1 Facilities Plan.

If mitigation measures proposed in the Step 1 plan fail to satisfy EPA concerns and EPA can determine that the proposed project is likely to contravene an existing federal, state or local environmental law or regulation, the Regional Office may condition a Step 2 or Step 3 grant, for example, on the stipulation that the local jurisdiction adopt certain specified growth management measures. Or, if a Step 2 or Step 3 grant has already been approved, EPA may withhold future payments, initiate a court injunction, terminate the grant and recover unexpended EPA funds or take other action necessary to ensure that the secondary impacts are addressed

Grant conditioning, however, can be imposed with mixed results. In situations where local officials recognize the need for land-use controls but have not been able to muster enough public support, an EPA grant condition may provide them with the ideal opportunity to institute land-use controls without jeopardizing their political support; EPA, in other words, becomes a convenient scapegoat. On the other hand, communities that see EPA grant conditions as direct interference with local home rule may be uncooperative in developing and/or enforcing the necessary land-use controls.

In fact, the conditioning of grants on the adoption of land-use measures raises a series of legal and political questions in terms of how far EPA can go in controlling what would be local land-use decisions. Furthermore, if not properly instituted, grant conditions can create a considerable administrative burden for EPA Regional Offices that must oversee local adherence to the conditions. Consequently, most grant conditions to date have been written so as to reinforce existing state or local legislation thereby leaving the administrative responsibilities with the local government involved.

CASE STUDIES

The experiences of three communities that have been involved with wastewater management facilities planning are examined in the following pages. Because community experience in dealing with secondary impacts is rather limited and effective mitigating measures are often difficult to implement, these case studies will focus primarily on the mitigation of these secondary impacts.

This detailed exploration of community experience should provide valuable insight into the kinds of issues raised and the types of conflicts which must be resolved. However, as with all case studies, there are limits on extrapolating from one experience to another. Every community is unique, and it is important to recognize that an approach which works well in one community may be unsuccessful in another.

The three case studies discussed here are taken directly from existing case study materials prepared by the EPA Office of Land Use Coordination, with only minor modifications. They were chosen to reflect a range of geographic conditions, community sizes and project types, and to illustrate a variety of measures for mitigating secondary impacts.

The Block Island, Rhode Island, case study involves a very small, self-contained community (year-round population: 500) supported by a sizable summer tourist business. The community had no existing sewage treatment facility and was experiencing serious problems with septic tank failures. In North Fremont County, Idaho, the situation involved a fairly extensive rural recreation area (over 600,000 acres) that had been experiencing increased development pressures. The area was served only by individual on-site septic systems, many of which were malfunctioning due to high ground water table conditions. Finally, the East Bay, California, case study involves the design of a subregional wastewater treatment, conveyance and disposal system serving several communities and a primarily urban population of over 400,000 people in the San Francisco Bay Area.

Each case study includes a brief description of the community or service area, its water quality problems and the proposed solution. The discussion focuses on major land-use issues raised by the project and the mitigating measures considered and adopted, including an evaluation of the effectiveness of those measures in cases where a project has been completed.

Block Island, Rhode Island

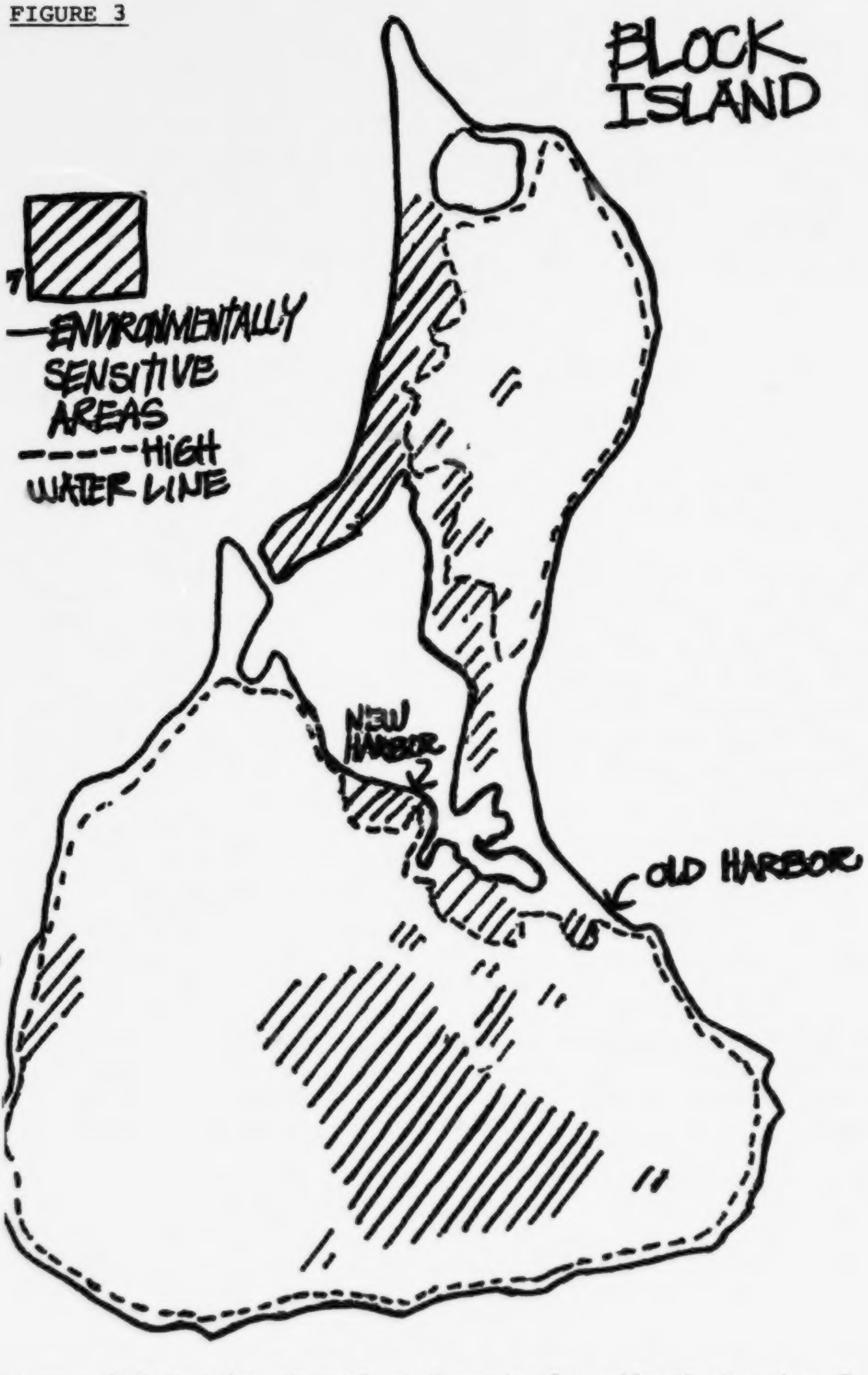
The community

Block Island (New Shoreham Township), located on Long Island Sound roughly 10 miles off the coast of Rhode Island, is a relatively small island of approximately 11 square miles. The island supports a small year-round population of about 500 residents. However, during the summer, the resident population increases to 1,700 and on a typical summer day another 1,000 - 2,000 tourists may be visiting the island.

Development on the island has been concentrated in the Old Harbor Area (see map). Old hotels, inns, rooming houses, restaurants and shops are clustered along the old harborfront; within a few blocks of the harborfront houses are spaced further and further apart, and stone walls enclose bayberry heath and abandoned pastureland. About 1.5 miles to the northwest, smaller scale, newer development has taken place in the New Harbor Area. The remainder of the island is largely open heath, pasture, numerous ponds and inland wetlands --of the island's nearly 7,000 acres, over 5,000 are in heath and open pasture, and another 1,000 acres are in water and wetland.

In 1972, the island adopted a Comprehensive Community Plan (CCP), which was prepared by the Rhode

FIGURE 3


BLOCK ISLAND
ENVIRONMENTALLY SENSITIVE AREAS
----- HIGH WATER LINE
NEW HARBOR
OLD HARBOR

Source: "Mitigating Secondary Impacts from the Wastewater Facilities Program: An EPA case studies series," EPA Office of Land Use Coordination (Unpublished).

Island Department of Community Affairs in consultation with the island's Town Council and Planning Board. The goals and policies outlined in the CCP include protecting environmentally sensitive lands and natural areas, preserving the rural New England character of the island and confining development to lands with good subsurface drainage suitable for septic tanks. The plan also cites the marked upturn in construction of new summer houses as a warning to plan wisely to protect the island's future environment and charm. In 1973, New Shoreham updated its 1967 zoning ordinance to conform with the new plan and to ensure the protection of wetlands, ponds and streams.

The problem

Until the late 1960's, the primary wastewater disposal method on the island was on-site sewage systems with either subsurface disposal or, more often, direct discharge of raw wastewater into the ocean. In the early 1970's, a ban on raw ocean discharge necessitated a switch to subsurface disposal.

The high density in the Old and New Harbor areas, however, did not allow enough land for adequate subsurface disposal, particularly during the peak summer season. New construction, which was increasing at the time, placed additional strain on the capacity of the soils. As a result, many on-site system failures occurred, creating a situation that was esthetically displeasing to the residents and also represented a potential community health hazard.

Proposed solution

Because of the town's serious sewage disposal problems, island officials hired a consulting engineering firm to study the situation and develop tentative plans for a municipal collection and treatment system. Based on the consultant's report, which was presented in February 1972, New Shoreham began application proceedings for federal aid. The town then contracted with the same engineering firm to design, supervise construction and start operation of the waste disposal system recommended in their report.

The initial plan submitted to EPA in August 1973 as part of their Step 2 grant request called for construction of a secondary wastewater treatment plant, interceptor sewers, two pumping stations, associated force mains and an outfall sewer off the breakwater near Old Harbor. The system (0.28 MGD) was designed to serve both the Old and New Harbor Areas (Stage I) with provisions to serve the area south of the Old Harbor in the future (Stage II).

Based on the Environmental Impact Assessment submitted by the town to EPA in April 1974, EPA's Region I office initially determined that environmental concerns had been considered in the final design of the plant, and therefore issue a Negative Declaration on the project. However, by mid-September the project had become the subject of serious public controversy. Citizens discovered that the project would not only cost $2.6 million more than originally estimated, but would also have serious growth implications for their community. The EPA Regional Office, recognizing the serious nature of the citizen's concerns, reversed its decision and decided to proceed with an Environmental Impact Statement.

Issues raised

Both the draft and final Environmental Impact Statement discussed in some detail the project's possible secondary land-use impacts. Based on development pressures along the island's coastline and proximity to the Northeast's recreation demand centers, construction of sewer lines and waste treatment capacity could predictably encourage growth within the service area. A major concern, however, was that such growth could take place at an accelerated rate if the sewer systems were permitted to expand with complementary changes in zoning densities, either by variance, special exceptions or by law amendment. The draft and final EIS warned that, based on the experience of other island resort communities and depending on the strength of development demand to force zoning changes and further expand treatment capacity, an extreme growth situation could result in the following secondary impacts:

- Impose resort complexes and residences on wetland and shoreland ecosystems and on flood hazard areas. Especially adverse would be encroachment upon the salt water marshes of the Great Salt Pond embayments as well as freshwater marshes; also vulnerable would be the south shoreline of Great Salt Pond and extensive areas in the south-central sector of the island proposed for "conservation" or "open space recreation" in the CCP.

- Facilitate condominium and high-density residential development in the extensive open moors, which are dotted with small lakes, to the southwest of New Harbor.

- Intrude upon the character of open space, marsh and upland vegetation and general sense of openness of the Great Salt Pond area and the view of Great Salt Pond and Block Island Sound.

- Stimulate medium-density residential development (1-acre lots) on the extensive "low density residential" and "conservation" areas southeast and south of Old Harbor that were proposed in the CCP. These areas embrace perched freshwater marshes, ponds, water supply recharge areas and the picturesque pasture-bayberry moor vistas of Old Harbor and the ocean from the Upland Plateau.

- Greater numbers, densities, and range of activities on the island would have an overall adverse impact on the high quality of the existing environment in the following ways:

  (a) on water quality through runoff from additional paved and impermeable surfaces, through some erosion and sedimentation of fragile ponds and wetlands associated with construction and continuing earth disturbance, and through additional solid waste-septage disposal and septic system operation --all associated with a higher level of development;

  (b) on noise levels through additional vehicles, lawnmowers and human activities;

  (c) on air quality through additional motor vehicles and power boats;

  (d) on visual appeal of sweeping vistas of sea, sand and sky; of rolling moors, pastures, ponds and vegetation;

  (e) on fragile ecosystems; salt and fresh water marsh associations, dunes associations and upland plant and animal associations.

The alternatives

The proposed project alternatives were carefully analyzed to ensure that an extreme growth situation would not occur and that the above impacts would be avoided. The analysis concentrated on what were considered the four most practical choices.

Alternative A. Construction of the project proposed by the applicant's consultant, which includes a treatment facility and collection

> system to serve the Old and New Harbor sections of the island (Stage I) with provisions to serve the area south of Old Harbor in the future (Stage II).
>
> Alternative B. Construction of the project (Stage I) without provisions for sewering the area south of Old Harbor in the future.
>
> Alternative C. No sewer construction, but a comprehensive program for the rehabilitation of individual septic systems.
>
> Alternative D. Construction of a treatment facility and collection system for the Old Harbor area only, with rehabilitation of individual septic systems in the New Harbor area.

The draft EIS recommended against allowing the situation to remain unchanged (the "do nothing" alternative) and against trying to solve the problem simply by upgrading existing individual septic systems (Alternative C). Also rejected was the original proposal (Alternative A) which was about to be enacted when the citizens raised their protests. This alternative was eliminated because wetlands and other environmentally sensitive areas made up a large portion of the area proposed to be sewered by Stage II. The draft EIS recommended two alternatives:

- The first would provide sewers in both commercial areas of the island, but eliminate the "Phase II extension" into residential areas contained in the orignal proposal (Alternative B).

- The second would provide public sewage capacity only in the dense Old Harbor commercial area and rely on improved septic systems in the less dense New Harbor area (Alternative D).

Of those two alternatives, the draft concluded that the second (D) was most appropriate. Pressures for induced growth would be minimized, particularly along the the strip between the two harbors. However, due to comments received on the draft, largely due to the insistence by the Rhode Island Department of Health that septic systems could not be made adequate in the New Harbor area, the final EIS recommended the first of the two alternatives (B), advocating that both commercial areas be serviced by public sewers rather than the Old Harbor alone.

Mitigation

Scaling down the originally proposed project design represented the first mitigating measure. Eliminating Alternative A reduced the size of the service area and meant that the project would not induce growth on wetlands and other environmentally sensitive lands within the originally proposed Phase II area. Service was thereby restricted primarily to the Old and New Harbor communities. The question remained, however, of protecting environmentally sensitive lands, primarily wetlands on the periphery of the two harbors, as well as lands adjacent to interceptors carrying wastes from the New Harbor to the treatment plant in the Old Harbor.

The second mitigating measure involved a specific condition to protect these areas from encroachment by new facilitated development. EPA's responsibility for protecting wetlands has been clearly enunciated in the agency's Wetlands Policy Statement published in the Federal Register on May 2, 1973 (Fed. Reg., Vol. 38, No. 84, pages 10834-5). The Policy Statement includes the following wording:

- "In its decision processes, it shall be the Agency's policy to give particular cognizance to and consideration to any proposal that has the potential to damage wetlands . . ."

- "In compliance with the National Environmental Policy Act of 1969, it shall be the policy of the Agency not to grant Federal funds for the construction of muncipal wastewater treatment facilities or other waste treatment associated appurtenances which may interfere with the existing wetland ecosystem, except where no other alternative of lesser environmental damage is found to be feasible."

EPA's Region I office therefore decided to condition the grant to protect wetlands by partially controlling the distribution of the limited amount of new growth the project may facilitate. The condition reads as follows:

> "The Town (New Shoreham) shall not permit any person to discharge wastewater into any collection line, lateral sewer, interceptor or other means of conveying wastewater to the treatment plant if such wastewater originates from any building, facility or other manner of construction which is hereafter erected or otherwise placed, in whole or in part, upon land which is a wetland area within the means of G.L.T.I.

> Title 2, 2-1-13 and 2-1-14 (Supp. 1974) (Rhode Island State Law). This condition is deemed to be for the protection of Wetland areas and shall constitute a bilateral agreement between EPA and the Town which may be enforced by any person who has an interest in the protection of such wetland areas, including year-round and part-time residents of Block Island."

It is important to note that the above condition reaffirmed Rhode Island law on the protection of wetlands and that it supports policies enunciated in the local comprehensive plan and zoning ordinance.

North Fremont County, Idaho

Community or planning area

The Island Park area of North Fremont County, Idaho, is a key recreational area in the state. Located near the Grand Teton and Yellowstone National Parks, it has become an increasingly popular summer and winter resort area. The proposed service area, which actually includes four development subareas, includes 601,000 acres, of which 596,000 acres are owned by the U.S. Forest Service and Bureau of Land Management. One thousand seven hundred acres are owned by the state, leaving only 2,300 acres in private ownership.

The problem

Like other recreational areas across the country, the Island Park area was experiencing increased development pressures. However, much of the private land available for development was not suitable for on-site septic systems because of high groundwater tables. No public sewage treatment facilities existed. In fact, most of the presently developed areas are located along rivers and lakes where groundwater tables are high. EPA and many of the existing subsurface county water quality studies indicated that subsurface waste disposal systems were malfunctioning, causing considerable contamination of subsurface high water by septic tank drainfill effluent and creating a serious public health problem.

In addition, land suitable for development was often located away from presently populated areas, and development in these areas would, according to the EIS, "create a sprawl into environmentally sensitive areas with serious adverse impacts on the vegetation, would-be habitats and degradation of waters from erosion and runoff." Because the county had no zoning or other similar land use regulations, it lacked the powers required to control this type of sprawl.

Development of solution

The EPA Regional Office was involved in the very early planning stages of the Island Park treatment facility. In preapplication meetings held in the spring of 1974, EPA discussed with the grantee and consultant the need for a thorough environmental assessment. The possibility of controversy, the nature of the sensitive environment and the potential for significant land use changes identified the project from its early stages as a candidate for an EIS.

The proposed Facilities Plan submitted to EPA for Step 2 grant approval involved individual collection, interceptor and treatment facilities for each of four sub-areas in the Island Park area. The facilities would be located in areas of concentrated existing or predicted future development. The project would be constructed in phases with the total costs ($6,941,500) spread out over 20 years. The capacity for each sub-regional system would range from roughly 50,000 gpd to 250,000 gpd.

Issues raised

In the fall of 1974 the Regional Office conducted a field study review, evaluating secondary impacts of the proposed project. The field study resulted in a recommendation to the Regional Administrator that an EIS be prepared. After review of the Step I plan, the Regional Administrator concurred, declaring that the EIS should address the following concerns:

1. The extent to which continued recreational development will impact the area resources;

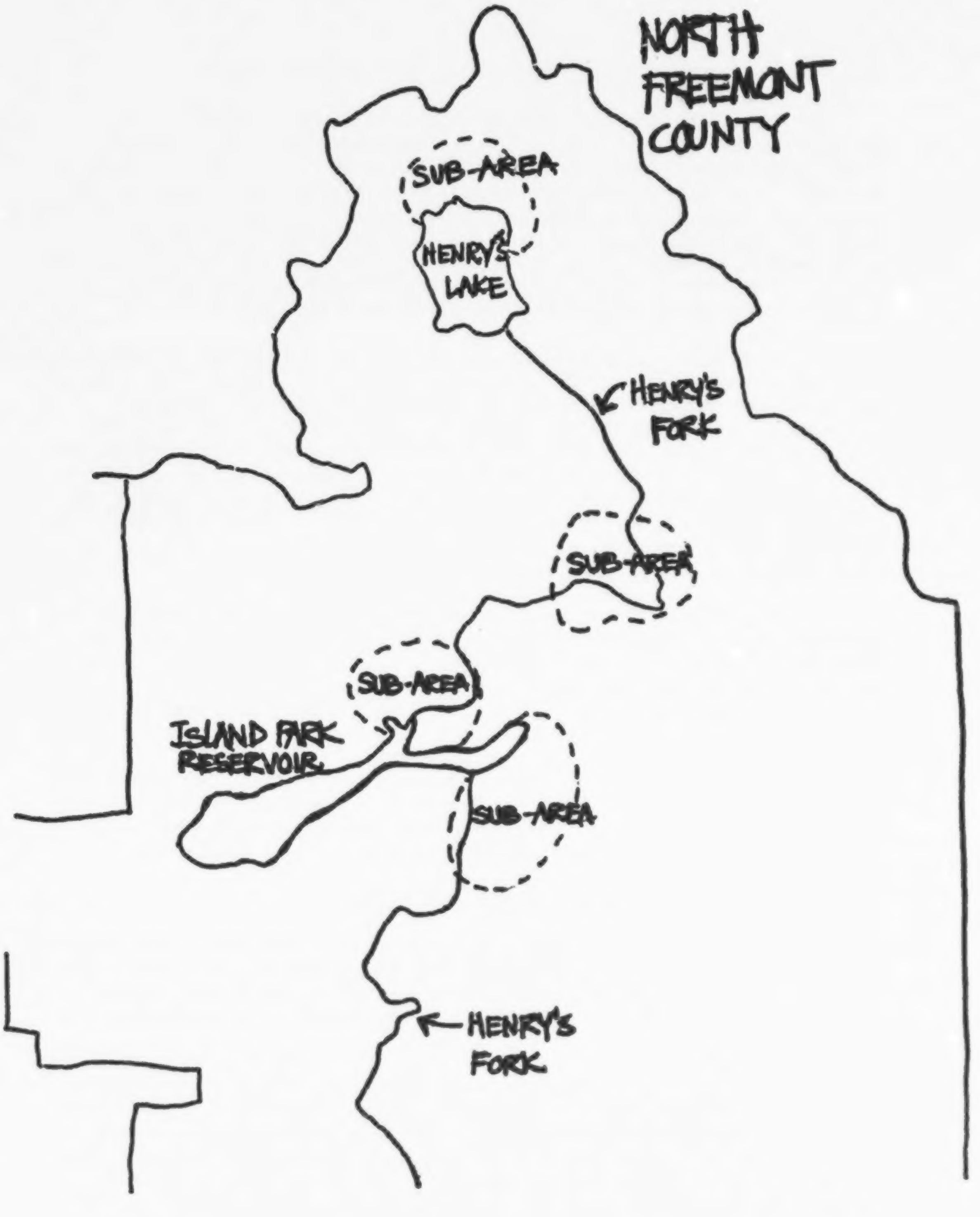
2. The extent to which the availability of sewage facilities will facilitate land-use changes or growth rate changes;

3. The absence of local land-use planning that might serve to control development or mitigate adverse impacts; and

4. Significant adverse secondary effects on the ecosystem in general and especially on fish and wildlife habitat.

A draft EIS was prepared in August 1975, and the final EIS was later issued in January 1976. The EIS process served as a vehicle to bring out comments from a number of agencies, organizations and concerned individuals. Concern for adequate mitigation of secondary land-use impacts was

FIGURE 4


NORTH FREEMONT COUNTY
SUB-AREA
HENRY'S LAKE
HENRY'S FORK
SUB-AREA
SUB-AREA
ISLAND PARK RESERVOIR
SUB-AREA
HENRY'S FORK

Source: "Mitigating Secondary Impacts from the Wastewater Facilities Program: An EPA case studies series," FPA Office of Land Use Coordination (Unpublished).

voiced in many of the responses to the draft EIS.

The U.S. Department of the Interior stated in a letter dated November 11, 1975, commenting on the draft EIS: "Much of what now makes the Island Park Area (Fremont County) a scenic, and esthetic and recreational attraction would be lost if the sewage system is constructed and development of further subdivisions is allowed. A more detailed discussion of the proposed project's secondary environmental impacts on the quality of recreation experiences in the Island Park Area would aid in project assessment."

The Idaho Department of Health and Welfare recommended in their November 3, 1975, letter that the final EIS should address the secondary impacts of induced growth in much greater detail than that given in the draft. The letter went on to offer the following comment: "We must emphasize that to be completely effective the project should be constructed in conjunction with a comprehensive land-use plan for the area. This would serve to limit growth and development in the area and ensure that the project achieves its objectives of reducing water pollution."

The Idaho League of Women Voters also indicated a concern about unplanned sprawl and the secondary land use impacts of the proposed project. In its October 27, 1975, letter the League stated: ". . . we do wonder about the statement that development will tend to be confined to those areas having a regional system. May we suggest that without proper countywide planning and zoning, development is going to continue wherever an enterprising developer believes it is economically feasible." These and other comments served to highlight the possible secondary impacts involved and underlined the need for effective mitigation measures.

Mitigating measures

The major secondary impacts were resolved both through through changes in the design and location of the facilities themselves and through conditioning the Step 2 and Step 3 grant on the county adopting growth management measures.

As the first mitigation measure, after early consultation with the EPA Regional Office, the consultant decided to plan for smaller treatment systems to serve the problem areas of greatest development activity as opposed to the originally proposed single regional system with connecting interceptors. This decision would tend to limit induced growth to areas previously committed to development rather rather than encouraging sprawl along interceptor routes or into environmentally sensitive areas.

The smaller systems would be developed in phases. The construction of each phase would depend on the severity of the local contamination problem and the size of the population to be served. The combined design technique of phased construction and individual facilities with limited reserve capacity would minimize the problem of induced growth associated with large facilities that have uncommitted excess capacity.

Preliminary cost estimates were prepared for a large regional system alternative serving all four sub-areas. No formal cost/benefit analysis was performed on this alternative, however, since it was screened from further consideration during early phases of facilities planning. This was done for several practical reasons: (1) There was considerable separation and distance between sub-areas. Transmission costs would be prohibitive and technical problems would result when trying to move low off-peak volume of sewage long distances. (2) Sub-regional phasing recognized the practicable limits of cost to users. User charges of a large regional system would have been prohibitive during early development of service areas with scarce concentration of connections. (3) Sub-regional phasing recognized the reality of the State of Idaho's priority system, i.e., with limited funds available to the state for the Construction Grant Program and with the project service a developing recreational area, the likelihood of obtaining priority for full funding of a large regional system was questionable. Phasing permitted funding over a period of several years. (4) In the absence of land-use controls in an area with significant growth potential, sub-regional phasing permits on-going evaluation of growth impacts and adjustment of projects for later phases as necessary. This in itself is a meaningful measure available to mitigate adverse impacts. If adverse impacts do result and do appear to be unavoidable, later phases of the project could be reconsidered by both the applicant and EPA.

The grant condition was the second mitigating measure. It was evident that a certain amount of growth would occur within the service area of the proposed sub-regional facilities. In the absence of planning, such growth would predictably occur in a haphazard fashion with adverse environmental impacts. The key to managing this growth to avoid further environment degradation was the extent to which Fremont County developed, adopted and implemented an effective, comprehensive land-use with companion zoning ordinances.

With proper planning and management, EPA felt that the provision of a sewage system would help protect environmental quality and at the same time ensure that development occurred in a way that would be sensitive to environmental problems. The EPA Regional Office therefore concluded that the following grant condition was necessary:

> Fremont County shall, in accordance with the State of Idaho Local Planning Act of 1975 (Chapter 65, Title 67, Idaho Code), develop and properly adopt a comprehensive land-use plan and implementing zoning ordinances applicable to the project area. The comprehensive plan shall include the participation of land-use management agencies in its formulation, implementation, and regular review and evaluation. Agencies considered for participation shall include such agencies as the Idaho State Land Board, the Idaho Department of Fish and Game, the Forest Service, U.S. Department of Agriculture, and the Bureau of Land Management, U.S. Department of the Interior. This condition shall be applicable to the Step 2 design grant and, as the project progresses, shall be carried over to apply to the Step 3 construction grant award. Payment beyond 80 percent on the Step 3 construction grant shall be contingent upon the satisfaction of this condition.

Regional justification for requiring that the county adopt a comprehensive plan and zoning ordinance was based on requirements in the Idaho Local Planning Act of 1975. That act calls for each county planning commission to adopt a comprehensive land-use plan. Section 67-6508 of the Idaho Code specifies that:

> "It shall be the duty of the planning or planning and zoning commission to conduct a comprehensive planning process designed to prepare, implement, and review and update a comprehensive plan . . ." (emphasis added).

In similar language, Section 67-6511 requires each county governing board to adopt a zoning ordinance:

> "Each governing board shall, by ordinance . . . establish within its jurisdiction one (1) or more zones or zoning districts where

> appropriate. The zoning districts shall be in accordance with the adopted plan" (emphasis added).

The Idaho Local Planning Act was unclear, however, about (1) what actions the state might take in the event that a county did not develop the required measures or (2) the question of establishing a timetable for counties with no planning or zoning to comply with the requirements of the Act. Nonetheless, the EPA Regional Office felt that it was clearly the intent of the Act to institute comprehensive planning and zoning at the local level and that the growth condition reinforced that intent.

Continuing Development

Because of the consultant's heavy workload (and partly due to loss of the consultant's office in the Teton Dam failure and flooding), the Step 2 grant was not awarded until June 30, 1976. The county, state and federal agencies accepted the grant conditions as proposed in the final EIS. Fremont County had not completed their comprehensive plan when designs and engineering specification for the facilities were completed in mid-1977, so the grant conditions were transferred to the Step 3 grant.

Construction on the project was scheduled to begin in the spring of 1978, with a draft comprehensive plan expected to be ready at about the same time. (The draft comprehensive plan must be finished before 25 percent of the construction has been completed or else EPA will withhold further funds.) Development of the comprehensive plan has been slowed because newly elected county commissioners had to be re-educated about the project, and because a great deal of public resistance exists to the concept of planning.

Despite their resistance to developing a comprehensive plan, the county commissioners felt obligated to proceed, primarily because the potential loss of federal construction funds would represent a significant financial burden to the county. According to schedule, then, the final comprehensive plan should have been completed by the fall of 1978, or before construction on the project is 80 percent complete. If not, then EPA has the option to withhold final payments.

Even assuming the county does develop an acceptable comprehensive plan, however, there is no guarantee that it will be used as intended to mitigate the secondary growth impacts of induced development. Unless the county is committed to the idea of controlling and directing growth within its boundaries, the comprehensive plan may become no more than an expensive set of colorful maps which, like many other similar plans, sit on office shelves collecting dust.

East Bay, California

The community

On February 15, 1974, the East Bay Dischargers Authority (EBDA) was formed as a joint powers authority to implement a subregional wastewater treatment conveyance and disposal program in the East Bay area adjacent to eastern San Francisco Bay (see maps). (The program would eliminate six shallow shoreline discharges of moderately treated, chlorinated effluent from the eastern shore of Lower and South San Francisco Bay.) The EBDA is composed of two incorporated cities and three sanitary districts in southwestern Alameda County, including the City of San Leandro, the Oro Loma Sanitary District, the Castro Valley Sanitary District, the City of Hayward, and the Union Sanitary District (serving Union City, the City of Fremont, and the City of Newark).

The service area includes a 1975 population of 456,300. Although much of the area is urbanized, a considerable amount of open space and agricultural lands still exists, including the area within the San Francisco Bay National Wildlife Refuge and prime farmlands in the Fremont area.

The problem

Although water quality in the entire bay system has been improving over the last several years as the result of improved point source control, some beneficial uses of the bay waters are still impaired. These include a restriction on shellfish harvesting for human consumption. Dissolved oxygen depression and toxicity are other localized problems in the bay, attributable to municipal discharges. Localized pollution conditions persist around much of the bay shoreline where surface discharges of treated effluent occur.

Proposed solution

The Phase I project would improve water quality along the east shoreline of the south area of the bay by providing a deepwater central bay discharge point to replace shallow shoreline discharges and thus permit increased dilution of effluent. The project also would eliminate two discharges of moderately treated sewage to sloughs upstream from the San Francisco Bay National Refuge and provide wastewater reclamation opportunities in the East Bay.

Planning for the Phase I Project officially began in 1971. The preliminary steps of the facilities planning stage were completed prior to EPA involvement. On November 12, 1974, EPA made a Step 2 grant offer to EBDA for the eligible portion of EBDA's facilities planning, as well as other preliminary planning.

The major part of the EBDA project developed under the Step 2 grant included construction of a force main interceptor and outfall system with a 1995 peak wastewater flow (PWWF) design capacity of 185 mgd, extending approximately 31 miles from the site of the existing Union Sanitary District Irvington wastewater treatment plant in the south portion of the City of Fremont to a discharge point in north-central San Francisco Bay. It also included the conversion of Union Sanitary District's existing treatment plants at Irvington and Newark to raw sewage pumping stations and the consolidation of Union Sanitary District's wastewater facilities at an expanded Union-Alvarado treatment plan with a 1987 average daily waste flow (ADWF) design capacity of 19.5 mgd.

The three existing plants for the City of Hayward, Oro Loma-Castro Valley Sanitary District and the City of Leandro, with a combined 1987 ADWF design capacity of 40.5 mgd, would discharge secondary treated effluent to the EBDA interceptor. The interceptor and outfall were sized to take in additional PWWF of approximately 19.7 mgd from the Livermore-Amador Valley Water Management Agency, which consisted of the cities of Pleasanton and Livermore, and the Valley Community Services District, all of which are located outside the EBDA service area.

EPA's review of the environmental assessment required of EBDA as part of the Step 2 planning process revealed an insufficient investigation of possible secondary land-use issues. As a result, EPA decided to issue an EIS and asked the EBDA member agencies to submit mitigation proposals for land-use issues identified during EIS preparation.

Land-use issues

The EIS analysis concluded that the project is not a direct causative element in the location or rate of future growth. However, construction of the wastewater treatment system will remove existing constraints to development and accommodate a projected 23.9 percent population increase--from 456,300 in 1975, to 565,700 in 1995. Many

FIGURE 5

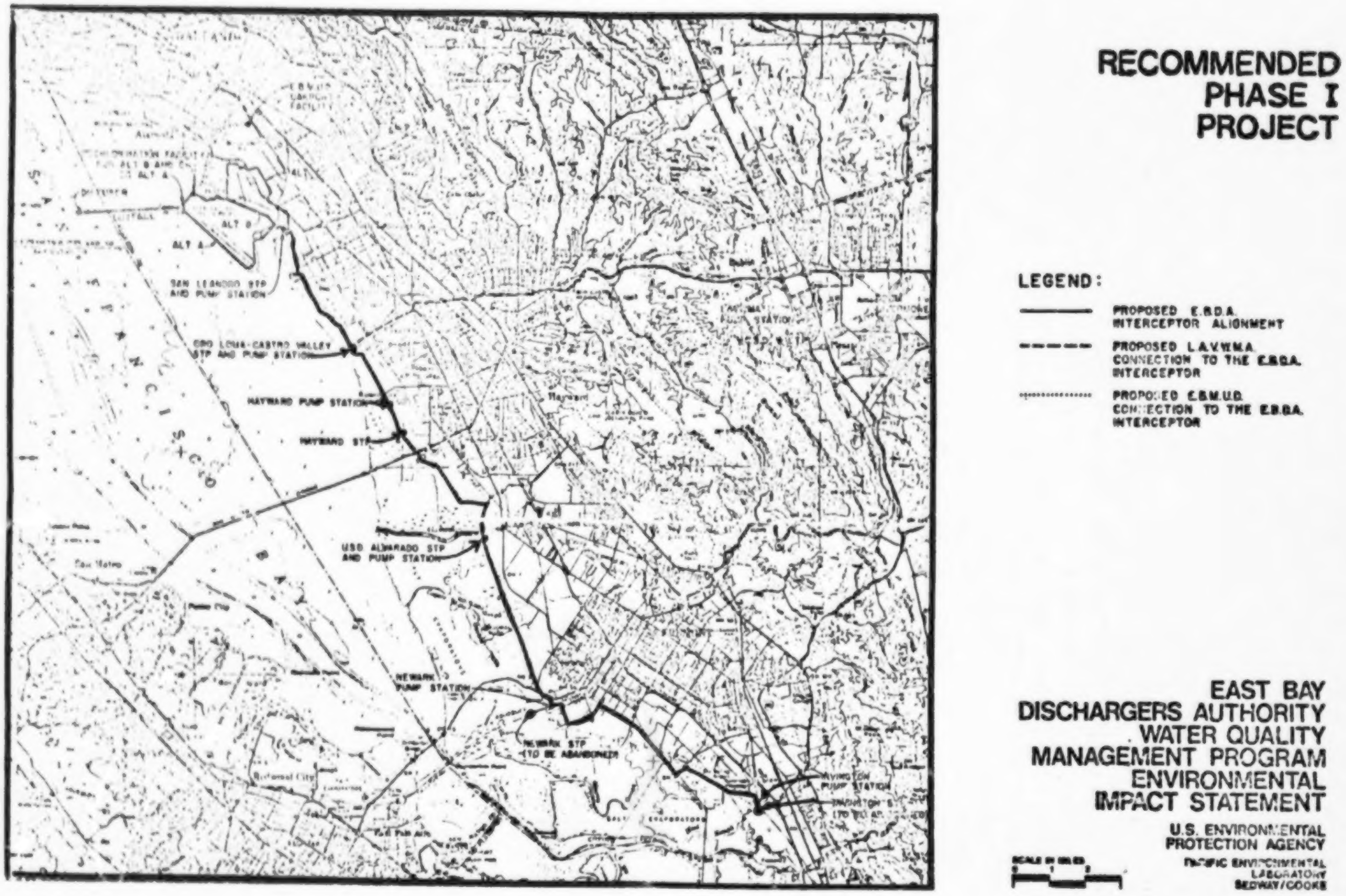

RECOMMENDED PHASE I PROJECT
LEGEND:
PROPOSED E.B.D.A. INTERCEPTOR ALIGNMENT
PROPOSED L.A.V.W.M.A. CONNECTION TO THE E.B.D.A. INTERCEPTOR
PROPOSED E.B.M.U.D. CONNECTION TO THE E.B.D.A. INTERCEPTOR
EAST BAY DISCHARGERS AUTHORITY WATER QUALITY MANAGEMENT PROGRAM ENVIRONMENTAL IMPACT STATEMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
PACIFIC ENVIRONMENTAL LABORATORY
BEDWAY/COOKE
SCALE IN MILES
0
1
2
ALT A
ALT B
SAN LEANDRO STP AND PUMP STATION
ORO LOMA-CASTRO VALLEY STP AND PUMP STATION
HAYWARD PUMP STATION
HAYWARD STP
USD ALVARADO STP AND PUMP STATION
NEWARK PUMP STATION
NEWARK STP (TO BE ABANDONED)
IRVINGTON PUMP STATION
Hayward
San Mateo
SAN FRANCISCO BAY

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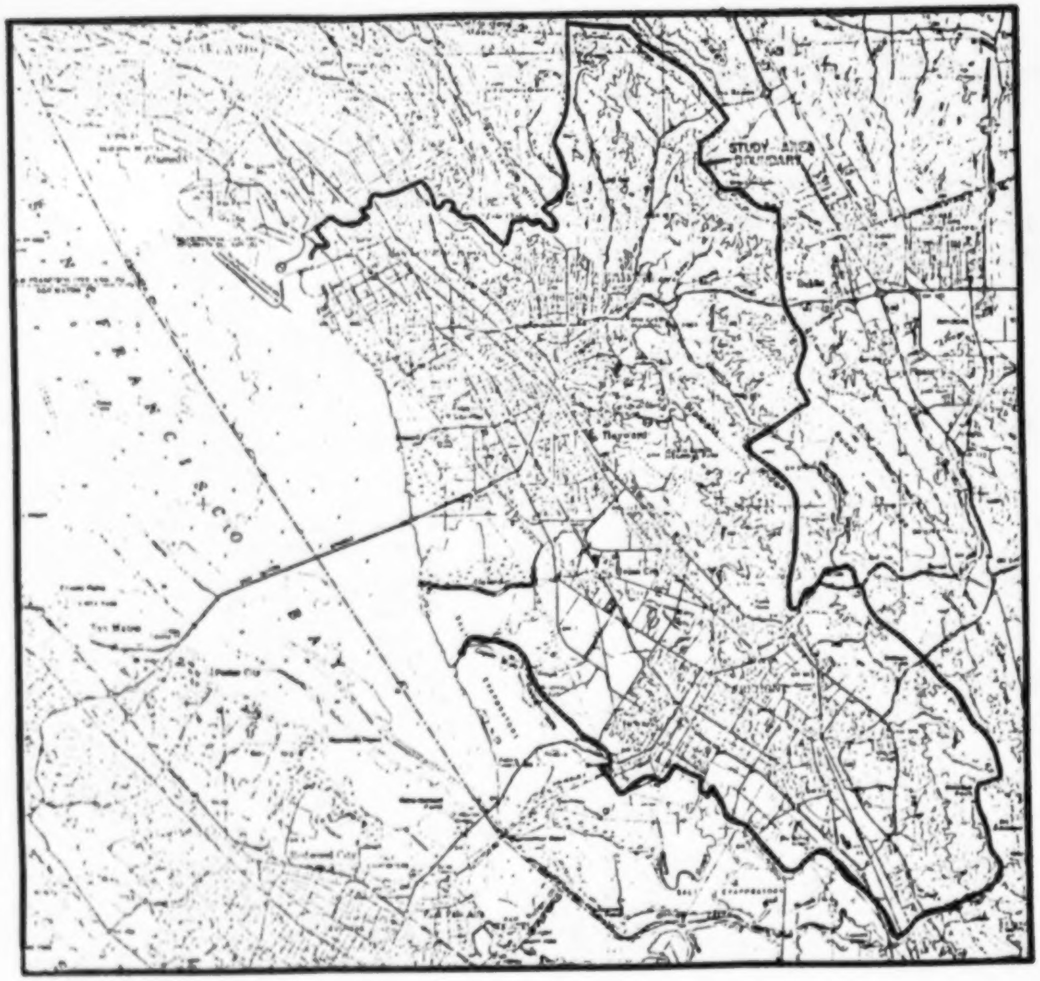
FIGURE 6


STUDY AREA BOUNDARY
SAN FRANCISCO BAY
Hayward

STUDY AREA

**EAST BAY
DISCHARGERS AUTHORITY
WATER QUALITY
MANAGEMENT PROGRAM
ENVIRONMENTAL
IMPACT STATEMENT**

U.S. ENVIRONMENTAL
PROTECTION AGENCY

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land-use impacts resulting from this projected population increase can be classified as secondary land use impacts. These impacts fall mainly into three categories: those affecting water quality and the aquatic environment, those affecting air quality, and those affecting agricultural and open lands.

A population increase could have an indirect impact on nonpoint source of pollutants to the South Bay ecosystem, affecting local biology and water quality. Permeable land surfaces would be covered with impermeable surfaces such as streets and buildings. Surface runoff would increase over the next 20 years as development occurs. The main aquatic habitats adversely affected by an increase in surface runoff would be those shoreline areas located in the southern half of the study area--principally the salt marsh, salt pond and mudflat habitats within the present boundaries of the San Francisco Bay National Wildlife Refuge. These habitats provide great potential for human esthetic enjoyment as open space and are of considerable biological value, providing homes to many species of animals, some of them rare and endangered.

A population increase has the potential to adversely affect air quality, since the type of development likely to occur would add considerably to the total vehicle miles traveled (VMT) in the area. (Approximately 21.1 million VMT would be generated daily by vehicle trips to, from and within the EBDA study area in 1995. This is a 21 percent increase over 17.4 million VMT in 1975.) Federal air quality standards are currently not being met in the project service area.

Even assuming certain reductions in air pollutant emissions per VMT over the next 20 years, it appears that federal standards would continue to be violated.

Residential and industrial development is projected to occur on prime agricultural land in the study area to accommodate the anticipated increase in population. Of the estimated 19,600 acres designated for future residential use by local governments, 5,900 acres are prime agricultural land, of which about 5,000 acres can be expected to be developed during the 1975 to 1995 period. A major portion of the absorbed agricultural land would be in Fremont if development is allowed in the Northern Plain area. Projected industrial development would absorb from 250 to 1,100 acres of an additional 3,160 acres of prime agricultural land that is now designated for industrial use by existing public policy.

Other potential indirect impacts include increased mudslide and seismic damage resulting from development of areas both west and east of the presently developed corridor.

Mitigating Measures

Following publication, public review and comment on the draft EIS, preparation and approval of a mitigation plan became a major EIS-related project activity. The work program for secondary impact mitigations was primarily directed at two major groups: (1) regional and subregional agencies, and (2) local county and city governing bodies and agencies. This approach was necessary because neither EBDA nor its constituent sanitary districts have any control over land-use planing, public or private transportation, or other significant factors contributing to air pollution. Further, they have little or no power to implement secondary air quality mitigating measures (EIS p. XVII-8).

The most beneficial and long-term mitigating measures were those tied to state and regional planning programs, such as the State Air Quality Maintenance Plans (AQMP), State Implementation Plans (SIP's) and the Association of Bay Area Government (ABAG) 208 water quality management planning. However, because these programs were not yet in effect, EPA required for phase I construction funding only that EBDA strive for short-term (4-5 years) mitigating measures, conceding that the "local general purpose government was the proper agency to propose and mitigate potential air quality emissions by strategies tailored to the local agency's capabilities, capacity, ability and resources to implement such measures" (EIS, XVII-9).

As a result of EBDA efforts, resolutions were passed by the local general purpose governments to perform additional studies, implement specific infrastructure investment proposals, and implement land-use measures. The applicant--EBDA--will be required by Step 2 and 3 grant conditions to take all reasonable steps to achieve implementation of these measures.

Because the major projected secondary impact of the EBDA project was increased air pollution from automobiles, primary emphasis was placed on reducing projected vehicle miles traveled (VMT) within the EBDA Study Area. A number of mitigation measures were proposed by the EPA Regional Office as parts of two major strategies. The first strategy is in two parts, Transportation Mitigations A and B: Transportation Mitigation A is a change or improvement of existing transportation facilities and services, and Transportation Mitigation B is a plan for auto use disincentives. The second strategy, Land Use Mitigation C, would reduce impacts by altering current land use policies and regulations. Best mitigation results occur when Mitigation C is used in conjunction with Mitigations A and B.

The following charts show the main mitigation measures suggested by EPA and agreed to by the local general purpose governments. Because some condensing and rewording was necesary to prepare the charts, some measures may appear different from the original measures submitted. A more exact assessment of measures actually planned for mitigation by the cities is available in the final EIS. A key feature of the mitigation measures is a commitment to participate in the areawide Air Quality Maintenance Planning effort.

The EPA Regional Office has suggested curtailing the loss of agricultural and open lands by deferring any further development on large scale sites with prime agricultural soils until completion of a study of the economic value and need for such lands. The Regional Office has also proposed that the communities reevaluate the areas now designated for residential development on the hillsides--with special reference to potential safety hazards for road and utility linkages needed to serve those areas--in an effort to mitigate possible mudslide and seismic hazards. However, there is no indication that the grantee or general purpose governments will agree at this time to the mitigation measures, and EPA Region IX does not believe it has the authority to require the measure.

Although the new longer outfall pipe is expected to improve water quality along the east shore of the bay, there is no existing plan for mitigating the project's secondary land-use impacts on water quality and the aquatic environment. Mitigation is, however, expected to be accomplished by implementing the Bay Area 208 Areawide Waste Management Plan.

TABLE 18

VWT Reduction Strategy # 1
Transportation Mitigation A
Improvement of Existing Transportation Facilities

	San Leandro	Hayward	Union City	Newark	Fremont
1. Extend Rapid Rail Service; add new service areas, bus stops and/or routes.		x		x	x
2. Provide transit rights-of-way: peak or 24 hr. transit lines and busways.		x		x	
3. Redesign terminals, stations, and bus stops to improve functionality.	x	x			x
4. Establish local transit service districts and improve existing service.	x	x	x	x	x
5. Incorporate subscription and charter service into local transit. Incorporate subscription/vanpool services at large employment centers.		x	x	x	
6. Develop bicycle routes.	x	x	x	x	x
7. Permit and encourage use of local, short-range, low-power vehicles.	x	x			
8. Coordinate schedules, fares, and transfers among systems.	x	x		x	
9. Improve services information system.		x			
10. Improve transit pricing structures, including generally lowered fares, and reimbursement of transit costs to shoppers.	x	x			

Source: "Mitigating Secondary Impacts from the Wastewater Facilities" Program: an EPA case studies series, Office of Land Use Coordination.

TABLE 19

VMT Reduction Strategy # 1
Transportation Mitigation B
Auto Use Disincentives

	San Leandro	Hayward	Union City	Newark	Fremont
1. Control parking supply. Reduce and limit public and employee parking on-street and in suburban lots.	x	x	x	x	x
2. Promote car-pooling by providing special bus/carpool lanes, preferential job sites parking, other free parking					
3. Encourage/require flexible and staggered work hours.		x			
4. Make downtown area parking requirements (for city planning) substantially less than city-wide standards.		x			x

TABLE 20

VMT Reduction Strategy # 2 Land Use Mitigation C	San Leandro	Hayward	Union City	Newark	Fremont
1. Increase planned intensity of all land use activities near transit stations and major transit corridors.	x	x	x		
2. Require minimum levels of land use intensity to be developed near transit stations and major transit corridors.	x			x	x
3. Phase location of development with respect to transit access.	x	x		x	
4. Increase planned intensity and variety of land use activities in major activity centers.	x	x	x	x	x
5. Regulate minimum levels of land use intensity to be developed in major activity centers.					
6. Have site plan review allowing city to require buffer zones.	x	x			

FOOTNOTES - CHAPTER VII

1. Mitigating Secondary Impacts from the Wastewater Facilities Program: An EPA Case Study Series, Office of Land Use Coordination, p. 4, unpublished report.

2. Direct Environmental Factors at Municipal Wastewater Treatment Works, EPA 430/19-76-003, January 1976, p. 6.

3. Final Environmental Impact Statement, East Bay, California Dischargers Authority Wastewater Treatment Facility, 1976, Chapter XVII.

4. "Consideration of Secondary Environmental Effects in the Construction Grants Process," EPA PRM 75-26.

5. Ibid.

6. "Protection of the Nation's Wetlands," 38 FR, May 2, 1973, p. 10834.

7. Mitigating Secondary Impacts from the Wastewater Facilities Program: An EPA Case Study Series, Office of Land Use Coordination.

APPENDIX A

Calculations of Present Worth

If the interest rate is 5% then the present Worth can be calculated as follows:

After the first year, the investment of Present Worth will be valued at PW x 1.05;
After the second year, the investment increases by another 5% and is equal to (PW x 1.05) x 1.05 = PW x $(1.05)^2$. But this must equal $1.00; thus:

$$PW \times (1.05)^2 = \$1.00 \text{ or}$$

$$PW \times (\$1.00/ (1.05)^2 = \$0.91.$$

Thus, $0.91 is the present worth of the receipt or expenditures of $1.00 two years from now.

A general formula for calculating PW using any interest rate is:

$$PW = \frac{E}{(1.0+i)^n}$$

where E = some expenditure
i = $\frac{\text{interest rate in per cent}}{100}$
n = the number of years from now that expenditure will be made.

If the project life is 20 years, then

$$PW = C_0 + C_1PW_1 + C_2PW_2 + \ldots C_{20}PW_{20}$$
$$+ OM_1PW_1 + \ldots\ldots\ldots\ldots OM_{20}PW_{20}$$

where C = capital costs

OM = operation and maintenance costs

$$\text{Equivalent Annual Cost} = \frac{(PW)\ (i)}{1 - \left(\frac{1}{1+i}\right)^n}$$

Page 251 and 252 blank.

User Charge Systems

Appendix B of the EPA regulations (40 CFR 35) provide three model user charge systems which are given below.

(1) Model No. 1 - If the treatment works is primarily flow dependent or if the BOD, suspended solids, and other pollutant concentrations discharged by all users are approximately equal, then user charges can be developed on a volume basis in accordance with the model below:

$$Cu = \frac{Ct}{Vt} (Vu)$$

(2) Model NO. 2 - When BOD, suspended solids, or other pollutant concentrations from a user exceed the range of concentration of these pollutants in normal domestic sewage, a surcharge added to a base charge, calculated by means of Model No. 1, can be levied. The surcharge can be computed by the model below:

$$Cs = \left[Bc\ (B) + Sc\ (S) + Pc\ (P)\right] Vu$$

(3) Model No. 3 - This model is commonly called the "quantity/quality formula":

$$Cu = Vc\ Vu + Bc\ Bu + Sc\ Su + Pc\ Pu$$

Ct = Total operation and Maintenance (O&M) costs per unit of time.

Cu = A user's charge for O&M per unit of time.

Cs = A surcharge for wastewaters of excessive strength.

Vc = O&M cost for transportation and treatment of a unit of wastewater volume.

Vu = Volume contribution from a user per unit of time.

Vt = Total volume contribution from all users per unit of time.

Bc = O&M cost for treatment of a unit of BOD.

Bu = Total BOD contribution from a user per unit of time.

B = Concentration of BOD from a user above a base level.

Sc = O&M cost for treatment of a unit of suspended solids.

Su = Total suspended solids contribution from a user per unit of time.

S = Concentration of SS from a user above a base level.

Pc = O&M cost for treatment of a unit of any pollutant

Pu = Total contribution of any pollutant from a user per unit of time.

Pt = Total contribution of any pollutant from all users per unit of time.

P = Concentration of any pollutants from a user above based level.

APPENDIX B

GLOSSARY

Activated Sludge - Sludge that has been aerated and subjected to bacterial action, used to remove organic matter in raw sewage during secondary waste treatment.

Activated Sludge Process - The process of using biologically active sewage sludge to hasten breakdown of organic matter in raw sewage during secondary waste treatment.

Advanced Waste Treatment/Tertiary Treatment - Treatment beyond secondary or biological stage required to meet strict quality standards. Depending on the process selected, advanced or tertiary treatment can provide additional removal of standard organic pollutants, suspended solids, inorganic ions or nutrients such as phosphrous and nitrogen. Advanced treatment is the "polishing stage" of wastewater treatment and generally produces a high quality effluent.

Ad Valorem tax - A value added tax such as a property tax.

Advanced waste treatment/tertiary treatment - Provides additional treatment above secondary treatment in order to provide additional removal of standard organic pollutants or to remove one or more specific organic compounds or inorganic ions from the stream. A number of processes may be involved depending on the pollutants to be removed.

Ambient Water Quality - Quality of the receiving waters into which effluent is discharged.

Average Flow - The average quantity of effluent which enters the treatment system over a given time period. Usually expressed as average daily flow.

Best Available Technology (BAT) - The degree of pollutant removal possible by application of the highest level of technology economically achievable. BAT standards are required for all toxic and nonconventional pollutants by July 1, 1984, unless a variance is obtained.

Best Practicable Technology (BPT) - The degree of pollutant removal achievable by application of the best average technology economically and technically practicable for a given industry. BPT standards are required of all industries by July 1, 1977, except where variances have been granted by EPA.

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Best Practicable Waste Treatment Technology (BPWTT) - The degree of pollutant removal required of all publicly owned treatment works in 1983. Defined by EPA as the equivalent of secondary treatment or whatever other treatment is required to meet water quality standards, BPWTT should involve reclaiming and recycling of water and confined disposal of pollutants so they will not migrate to cause water or other environmental pollution as well as consideration of advanced waste treatment techniques.

Biochemical Oxygen Demand (BOD) - The quantity of oxygen used in the aerobic decomposition of organic matter, usually expressed in parts per million. The degree of BOD removal is used as a measure in determining the efficiency of a sewage treatment plant as well as in measuring stream water quality.

Cesspool - Large porous cistern into which residential wastewater flows. Solids remain in the cistern while the effluent, a liquid portion, seeps out through the walls into surrounding ground. Because little biological action takes place in the cesspool, the solids must be removed by frequent pumping.

Chemical Oxygen Demand (COD) - A measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water. The COD test, like the BOD test, is used to determine the degree of pollution in an effluent.

Chlorination - The application of chlorine to drinking water, sewage, or industrial waste for disinfection or oxidation of undesirable compounds.

Coliform Bacteria - A class of bacteria that live in the human intestines. They are always present in raw sewage. Their presence provides positive evidence of pollution and the possible presence of the pathogenic bacteria.

Combined Sewers - A sewerage system that carries both sanitary sewage and storm water runoff. During dry weather combined sewers carry all wastewater to the treatment plant. During a storm only part of the flow is intercepted because of plant overloading; the remainder goes untreated to the receiving stream.

Cost-Effectiveness Guidelines - Developed by EPA to aid grantees in the selection of the waste treatment management system component which will result in the minimum total resources cost over a fixed period of time to meet federal, state and local requirements.

Design Flow - The average quantity of wastewater which a treatment facility is designed to handle, usually expressed in millions of gallons per day (MGD).

Design Period - Time span over which wastewater treatment facilities are expected to be operating; period over which facility costs are amortized.

Effluent - (1) A liquid which flows out of a containing space. (2) Sewage, water or other liquid, partially or completely treated, or in its natural state, flowing out of a reservoir, basin or treatment plant; or part thereof.

Effluent Limitations - The maximum amount of a pollutant that a point source may discharge into a water body. They may allow some or no discharge at all, depending on the specific pollutant to be controlled and the water quality standards established for the receiving waters.

Effluent Limited - Stream segments which meet and will continue to meet water quality standards once the national uniform point source controls are applied.

Environmental Impact Assessment (EIA) - A preliminary evaluation of the potential environmental impacts (positive and negative) of a proposed federally funded sewage treatment project. It should be submitted ss part of the Facilities Plan.

Environmental Impact Statement (EIS) - A detailed analysis of the potential environmental impacts of a proposed project required when the EPA Regional Administrator determines that a project is highly controversial or may have significant adverse environmental effects.

Facility Plan - Preliminary plan developed during the first step (Step 1) of the Three Step Construction Program. The plan, based on an evaluation of various treatment alternatives, must be both cost-effective and politically acceptable.

Fecal Coliform Bacteria - A group of organisms common to the intestinal tracts of man and of animals. The presence of fecal coliform bacteria in water is an indicator of pollution and of potentially dangerous bacterial contamination.

Force Mains - Pipes used to remove wastewater under pressure against the force of gravity, allowing for the transfer of sewage between natural drainage basins or for conveyance of wastewater at minimal slopes over relatively long distances.

Grant-Eligible - Refers to costs of planning and constructing a treatment facility which may receive federal funds under the EPA Construction Grants program.

House connection (or house laterals) - This is the point of contact between the user and the treatment system.

Industrial Cost Recovery - A provision in the 1972 FWPCA which requires industries to pay back to the federal government the extra capital costs that their discharges impose on municipal treatment plants. (The 1977 Clean Water Act established an 18-month moratorium on Industrial Cost Recovery.)

Infiltration/Inflow - Total quantity of water entering a sewer system. Infiltration means entry through such sources as defective pipes, pipe joints, connections, or manhole walls. Inflow signifies discharge into the sewer system through service connections from such sources as area or foundation drainage, springs and swamps, storm waters, street wash waters, or sewers.

Interceptor - Any pipe regardless of size that carries wastewater directly to the treatment plant. Generally, they are the largest pipes in the collection system.

Lateral - The pipe to which individual houses and business establishments attach. If one considers the analogy of tree, the laterals represent the twigs.

Main/Submain - The word main is frequently used loosely to indicate a large pipe which is not a lateral and not an interceptor. It frequently forms one of the larger branches of a complex collection system.

National Pollution Discharge Elimination System (NPDES) The effluent discharge permit system establishes under the 1972 FWPCA which places conditions on the type and concentration of pollutants permitted in the effluent; and schedules for achieving compliance.

Non-Point Source Pollutants - Pollutions which do not enter the water from any discernable, confined and discrete conveyance but rather wash off, run off or seep from broad areas of land.

Packaged Treatment Plant - A small treatment plant which is partially or completely preassembled by a manufacturer and shipped to a designated location. They are available in a range of sizes from units designed to serve a single dwelling to modular units capable of handling one million gallons per day (MGD).

Peak flow - The maximum volume of effluent expected to enter a treatment system over a given time period. Treatment systems are designed based on an estimate of the rate of peak flow to average flow for different segments of the system.

Plan of Study - An initial brief description of the scope, schedule and costs of a proposed facility plan. It must be prepared by the grantee and approved by the State and EPA before a Step I grant can be approved.

Point source pollutants - Those that enter the water from any discernable, confined and discrete conveyance such as a sewer pipe, culvert, tunnel or other channel or conduct.

Pretreatment - In wastewater treatment, any process used to reduce pollution load before the wastewater is introduced into a main sewer system or delivered to a treatment plant for substantial reduction of the pollution load.

Pressure main - Some systems rely entirely on forced pumping (as opposed to gravity flow) of sewage, to enable use of smaller pipes and simplify design and construction in difficult terrain.

Primary impacts - Those which can be attributed directly to a proposed action.

Primary Treatment - The first stage in wastewater treatment in which substantially all floating or settleable solids are mechanically removed by screening and sedimentation. The process generally removes 30-35 percent of total organic pollutants.

Priority list - A list developed by the state Water Quality Agency of proposed waste water treatment projects in the state. Projects are ranked according to their priority relative to the state's overall water quality management strategy and Federal Construction Grant funding is distributed accordingly.

Reserve capacity - Treatment system capacity which exceeds that required to meet projected community needs for a given time period. The law requires that treatment facilities be designed to include "sufficient" reserve capacity to service future growth. However, EPA will not fund excessive reserve capacity. The actual amount of reserve capacity funded by the Federal grant must be approved by the Regional Administrator.

Sanitary Sewers - Sewers that carry only domestic or commercial sewage. Storm water runoff is carried in a in a separate system. See sewer.

Secondary impacts - Those resulting from indirect or induced changes in community land use patterns, population and economic growth, and environmental quality resulting from induced growth.

Secondary Treatment - Wastewater treatment beyond the primary stage, utilizing bacteria to consume the organic pollutants. A number of processes may be used to achieve what EPA defines as acceptable secondary treatment standards--85-90 percent removal of total organic pollutants and suspended solids.

Septic Tank - The most popular on-site treatment technique relies on a collection tank which receives waste from the home and provides a period of settling, during which a significant portion of suspended solids settle out and are gradually decomposed by bacterial action at the bottom of the tank. The remaining sewage is discharged into a drain field composed of lengths of porous or perforated pipe placed at shallow depths. A well designed and maintained system will provide ecologically sound treatment.

Service Area - The area which will be serviced by a wastewater treatment system.

Sewage - Sewage refers to the wastewater flow from residential, commercial, and industrial establishments which flows through the pipes to a treatment plant.

Sewerage - Sewerage refers to the system of sewers, physical facilities employed to transport, treat, and discharge sewage.

Sewer - Sewer refers to the pipe, conduit, or other physical facility used to carry off wastewater.

Sewer or Sanitary District - A sewer district is either a semiautonomous governmental unit whose purpose is the provision of sewerage or a special assessment district within which sewerage facilities are provided to residents.

Sludge - The accumulated settled solids deposited from sewage or industrial wastes, raw or treated, in tanks or basins, and containing more or less water forming a semi-liquid mass.

Storm Sewer - A conduit that collects and transports rain and snow runoff back to the ground water. In a separate sewerage system, storm sewers are entirely separate from those carrying domestic and commercial wastewater.

Suspended Solids (SS) - Small particles of solid pollutants in sewage that contribute to turbidity and that resist separation by conventional means. The examination of suspended solids and the BOD test constitute the two main determinations for water quality performed as wastewater treatment.

Tertiary Treatment - (see Advanced Treatment)

Trickling Filter - A device for the biological or secondary treatment of wastewater consisting of a bed or rocks or stones that support bacterial growth. Sewage is trickled over the bed enabling the bacteria to breakdown organic wastes.

User charges - Fees levied upon users of a wastewater treatment system based upon the volume and characteristics of the waste.

Waste load allocations - Distribution of the total "pollutant load" permitted on a particular water body among the various discharges to that water body. (required by section 303 of the Clean Water Act. The "pollutant load" for a particular water body is determined by the water quality standards established for that water body. Waste load allocations are applied in situations where stream segments are classified as water quality limited. They will generally result in imposition of stricter effluent limitations on discharges to a particular stream segment than secondary treatment.

Water quality criteria - The levels of pollutants that affect the suitability of water for a given use. Generally, water use classification includes: public water supply; recreation; propagation of fish and other aquatic life; agricultural use and industrial use.

Water quality limited - Stream segments which will not meet water quality standards with the application of uniform point source controls. Additional pollution control measures for industrial and municipal discharges will be required if water quality standards are to be achieved.

Water quality standard - A plan for water quality management containing four major elements: the use (recreation, drinking water, fish and wildlife propagation, industrial or agricultural) to be made of the water; criteria to protect those uses; implementation plans (for needed industrial-municipal waste treatment improvements) and enforcement plans, and an anti-degradation statement to protect existing high quality waters.

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